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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

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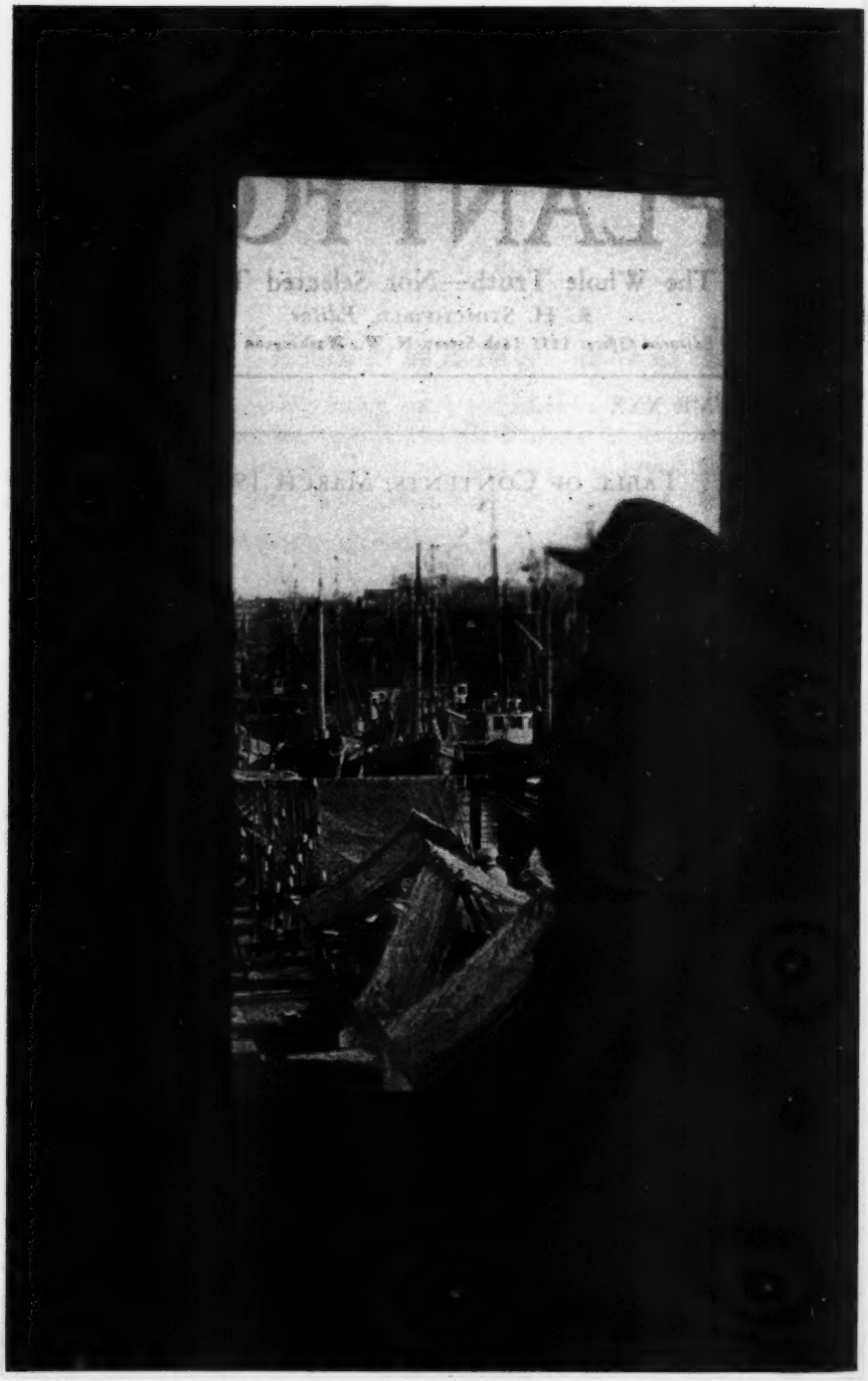

SOME IMPLEMENTS FOR FARMING THE SEA

Better Crops with PLANT FOOD

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VOL. XXX WASHINGTON, D. C., MARCH, 1946 No. 3

Some ideas for . . . . . .

WHEAT WINNOWINGS

Jeff McDermid

FASTING foreigners who derive from 50 to 80 per cent of their daily calorie needs from wheat and other cereals are gazing through the ruins of blasted farms and mills toward our abundant shores, where only 15 to 20 per cent of the daily calorie intake consists of "breadstuffs." So to us an oft-dreaded surplus crop becomes a new goal of endeavor.

This urgent humanitarian cry for succor puts wheat once more in the spotlight and makes an essay on it quite timely. If this call for relief had come to us back in the last years of the nineteenth century, our power to provide quick help would not have compared favorably with the facilities we now possess for delivery of wheat—barring present temporary railway congestion.

For in those days which many of us treasure in rural memory, our wheat crop was not really a commercial product on a specialized scale. The humid regions of soft winter varieties stretching from the Mississippi to the Atlantic and south to the middle borderlands, as well as parts of the moist Lake States and the northeast plateaus, were not extensive wheat areas, but farmers usually grew "more or less" wheat for themselves, their livestock, and for crop rotation purposes.

You remember how the old grist mills graced many a country brookside or lake edge, with dams and water wheels, flumes and gates, rock foundations, handtrimmed grinding stones, and a jolly, dusty miller taking toll from his farm customers. Artists and camera fiends found his institution about as picturesque as the w. k.

brawny smith's clanging shop. Directions given to strangers usually put in a mill as the guide and landmark, so common and widespread were those flour factories in our humble, self-sufficient, localized, provincial economy.

"Gone are the days" all right, and in the swift interval of a short lifetime those old mills have followed such former necessities as the hitching post, the kerosene lamp, and the family-sized three-holer into the inefficient and unmourned past. So likewise has our small-farm wheat production vanished and yielded to "wheat-ocean" ranches with combine flotillas bounding over waves of golden grain.

THERE have been ups and downs and cycles of lean and fat seasons among the wheat gentry, but aside from this, the marvelous panorama of progress and unending technical improvement and power marking the wheat kernels path from planter to pantry has become an epicurean epic, peculiar to this great land of gripers.

Serving the wheat grower, now characterized by the presence of 65 per cent or more of our total volume of wheat production in the western and northern Great Plains, are a legion of caterers and equippers, service agencies, cheer leaders, and advice givers. There are more sideline assistants on the wheat front than there were for all of agriculture in the not-too-distant past.

Wheat must be bred right to yield well against mid-continental weather and adversities too numerous to mention. Hence the army of plant breeders, seed selectors, hybridizers, geneticists, pathologists, and just plain seedsmen.

The wheat plant must grow in fertile and favorably balanced soil—potash, phosphate, nitrogen, lime, magnesium salts, humus—and so along come the chemists and the mechanical mixers and weighing outfits and the vast warehouses and demonstrators, the county agent "plotters" and the know-how dealers at the trackside.

The wheat plant must be seeded and harvested on large farms by few men. Here, in answer, have come all the resources of the drafting room, the laboratory, the motor designer and fuel expert, the gear and sprocket boys, and the rough-and-ready engineers—each season springing something newer, better, and faster, defying all but the aircraft industry to keep up the forward pace.

Again there are out-reaching agents to distribute and demonstrate and repair and maintain thousands of motorized and electric-connected, grain-reaping juggernauts, sweeping away with defiance all the threats with which the IWW "Wobblies" once scared the harvesters, and reducing the whole major production picture to a canvas of mural proportions.

Then we look in vain for the little mills and the horse-drawn loads of 50 to 75 bushels toiling to town, the five-acre wheat plots near the bean patch, and the old cow-manure rejuvenating system used of yore. As a matter of fact, there is one big reason we might forget which influenced this wheat turntable, and that is the way that the chinch bug, red rust, and the cow business divorced two-thirds of American farmers from commercial wheat culture.

AS a result of this shift in wheat growing from a selfsufficing and widely scattered industry to a strictly commercial one with only about a dozen states specializing in it, the utilization of the crop and its magnitude as well have both greatly changed.

We may have fewer states and fewer men engaged in actual wheat production these days, but we have more skilled employment and larger incomes from the wheat service industry as a whole than ever before. Moreover, the wheat kernel has been separated and screened over in modern practice so that the net result in late years has been less of it in toto for the human stomach and more of it for the feed bag. To carry this out further might entail much guesswork as to the relative net worth of wheat flour and the feed-offal resi-

dues, respectively, to sustain human energy, the flour by direct use and the coarse parts of the kernel for eventual use through livestock channels. But some progress in processing is clearer to demonstrate to human advantage than the flour and feed angle.

Better bred wheats and certified seed make it possible for about two square feet of land to raise enough cereal to make a loaf of bread. The old buhrstones of long ago are replaced by corrugated chilled steel rolls, each succeeding pair finer than the first, until finally the top grade patent flour goes through a set of silk mesh drums and receives its last polish of perfection and fineness. The selecting, grading, bolting, and dividing of the component parts of the berry—first and second clears, red dog, bran, shorts, and wheat middlings—are now controlled by a gigantic industry, with occupational and professional skill of the very highest order.

Gone are the primitive aspects of the wheat-milling game, but its romance remains as thrilling and inspiring as ever, in a different and a better way. Your granddad brought home country grist which contained chaff, weed seeds, bugs, dust, dirt, and disease spores, plus the fuzz from kernel coats all in one package. To be sure the present milling methods ordinarily get only about 50 per cent of the berry into the take-home flour sack, but most of the balance either returns as eggs, meat, or milk or gets onto the land as fertilizer.

Today the average normal rate of milling yields one barrel of flour from 139 pounds of wheat, or about 2.35 bushels of wheat. This 139 pounds of wheat when milled by 72 per cent extraction gives about 100 pounds of flour and 39 pounds of stock feed. Under the new 80 per cent extraction rate, there are about 111 pounds of flour and 28 pounds of feeding stuffs. This means about 11 per cent more flour yield and 25 per cent less feed production from each bushel of wheat under the emergency ruling to obtain greater human breadstuffs from wheat, at some expense to the livestock feeding fraternity.

RIGHT here we pause to adjust our thinking again. In the first World War there were two different situations facing Americans relative to wheat and flour than obtain at the end of World War No. 2. First, our acreages and yield and our surplus for export in 1915-20 were under par. We were just emerging from the isolated and scattered wheat culture era, lacked modern facilities for its improvement, and had a larger per capita rate of wheat consumption at home than we have had recently. This meant that one of the big food increase campaigns of the other war era was hitched to wheat, and once it got started as it did during the war, it was hard to stop it from running into astronomical tonnages.

Second, households in the other war period and for a few years after toted home bigger flour sacks and bought flour oftener than they do now. Even the farm wife has quit baking bread, imitating her city cousin in the weekly purchase of favorite brands at the convenient bread rack at the fancy food store. Consequently the bulk of the bread business belongs to the professional baker, and he is the one who transacts most of the heavy flour contracts with millers rather than the wholesale grocer and food jobber. Any move now toward conserving any vast amount of wheat simmers down to a deal with the bakers, leaving the consumer the privilege of eating fewer

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Tomatoes Are A Field Crop In Western Ohio

By John Bushnell

Ohio Agricultural Experiment Station, Wooster, Ohio

TOMATOES grown for canning are an increasingly important crop in western Ohio. In the prewar decade, 1930 to 1940, the acreage doubled and, as expected, increased further during the war.

Only a small part of this acreage is found on specialized farms where tomatoes are the principal crop. The bulk of the crop is grown in small fields on general farms, where the tomatoes are an incidental cash crop.

This practice is economically sound. The individual farmer does not need to invest in special equipment to grow tomatoes, neither does he need to go out of his way to obtain plants in the spring or to hunt markets when the crop ripens. By long-established precedent, the grower contracts with a processor who buys the crop, supplies the plants, and loans the setting implements.

Fig. 1.—The natural fertility of the soil is the chief factor in the location of factories processing tomatoes in Ohio. List of factories furnished by the National Canners Association, 1944. Soil Classification from Conrey (2).

Except for the initial cost of the plants, which averages about $15 per acre, and some additional fertilizer, the expense and the labor involved in planting and cultivating tomatoes are similar to those of growing field corn. When a farmer considers the possibility of producing tomatoes he thinks of costs and returns in comparison with those from corn. In most seasons tomatoes have been more profitable than corn and in consequence more and more farmers have taken to growing a few acres.

The size of an individual farmer's planting depends in part upon his labor supply during the picking season. On grain farms this is a period of slack time between the harvesting of small grain and the harvest of corn. A farmer with one helper can ordinarily pick, load, and haul about an acre a day in addition to handling the routine work of the farm. Women and children often help pick. Tomatoes need to be picked once every five to seven days, hence, if the pickers cover an acre a day, five or six acres can be grown. During the peak of picking in Ohio the crop often yields five tons per acre. Thus from a five or six-acre field the peak of picking and hauling is only five or six tons per day. A truck of moderate size easily carries these in two loads.

The deduction that five or six acres make an economic tomato planting on an average farm is supported by the census reports. In 12 prominent Ohio

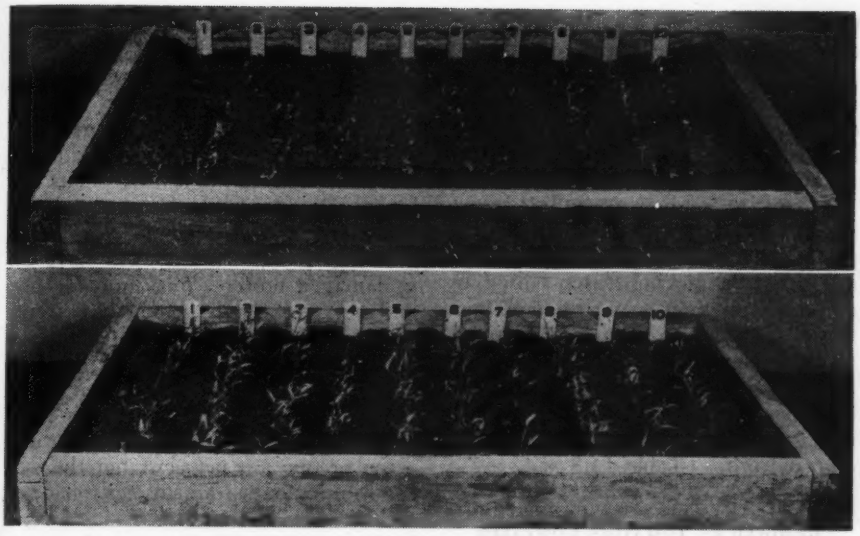

Fig. 2.—Tomato seedlings in flats held in refrigerators, above at 50°F. and below at 55°F., photographed 22 days after seeding. Ten varieties were planted to see if some would germinate more rapidly than others at these low temperatures. The differences were too small to be of practical significance.

tomato counties in 1939 there were 16,384 acres on 3,101 farms, an average of 5.28 acres per farm.

There is also in Ohio, as in other canning districts, a number of growers who plant tomatoes as their principal crop. To keep down diseases, tomatoes need at least a four-year crop rotation, hence the advisable limit of the acreage on a farm is one-fourth of the suitable land. These growers depend upon migratory labor, or draw upon nearby towns for help during the harvest season. The training and supervision of this seasonal labor are likely to be the most difficult phase of this large-scale type of tomato growing. In northwestern Ohio the climate and much of the soil are favorable for tomatoes; in this area large scale production seems destined to increase.

Soil and Fertilizer Requirements

Growing tomatoes for canning in Ohio is largely restricted to the western half of the State where soils were derived from limestone, (Fig. 1). These tomato soils not only have a higher calcium content than the eastern soils of the State but are much higher in available phosphorus. In the writer's opinion it is the available phosphorus rather than the calcium that makes possible the production of tomatoes as a field crop. There is abundant evidence in the literature that tomatoes require a specially high level of available phosphorus, or must be given a large application of high-phosphate fertilizer. The crop is successfully grown in eastern Ohio by market gardeners who think nothing of applying 1,000 to 2,000 pounds of fertilizer per acre, but such applications seem unreasonable to the general farmer. Consequently, the actual acreage grown as a field crop is restricted to the higher phosphorus soils.

The natural fertility of these soils, which are mostly dark-colored and predominantly of the Brookston series, is readily shown by laboratory tests. By Truog's test (4) the available phosphorus in samples from 50 fields averaged nearly 200 pounds per acre. The replaceable potassium by Thornton's test (3) likewise averaged about 200 pounds per acre. The current fertilizer applications on such soils range from 300 pounds per acre upward of 3-12-12,

0-12-12, or 0-20-20. The average application might be estimated at 400 pounds per acre, or about twice the amount currently applied to the corn crop. With these relatively small applications, yields of 15 tons per acre are not uncommon in favorable seasons.

Where no fertilizer is applied, phosphorus deficiency often shows in slow growth of the young plants, and toward the end of the picking season symptoms of potassium deficiency are sometimes seen. The tomato crop is a relatively heavy feeder on potassium. Chemical analyses of the fruits show that a 10-ton crop of tomatoes removes almost five times as much potash as a 50-bushel crop of corn. (Table 1).

TABLE 1.—FERTILIZER CONSTITUENTS REMOVED BY TOMATOES COMPARED WITH CORN.

	10 tons of tomatoes, fruit only	50 bu. of corn, grain only
	Lbs.	*Lbs.*
Nitrogen	40	45
Phosphoric acid	14	18.5
Potash	64	14

Although the actual average yield of tomatoes in Ohio is only 6.1 tons per acre, the skillful grower expects 10 tons, at least in favorable seasons. In view of the amount of potash removed by a 10-ton crop, our recommendation is to use a fertilizer high in potash, such as 0-12-12 or 0-20-20, and to apply enough at least to replace the amount removed by the fruit.

Recently, the plowing down of nitrogen ferilizer also has been recommended. Although the soil is dark-colored and relatively high in organic matter, the physical condition has deteriorated under past practices until the nitrification processes do not appear to proceed rapidly enough to supply the nitrogen needs of the plant. Nitrogen deficiency often appears by midseason. Plowing down 200 to 400 pounds of cyanamid or sulphate of ammonia has at least partly overcome this deficiency. (1).

Seeding Directly in the Field

During the past decade the growing of tomatoes by planting seed directly in the field instead of setting plants has been rather widely advocated in the Midwest. It is asserted that the plants growing directly in the field have an undamaged taproot, root more deeply, and survive drouth better than transplants. Moreover, such plantings escape the risk of infection from diseases that may be introduced on transplants. It is admitted that plants from direct seeding will fruit later and yield a ton or two less per acre, but the saving in initial cost compensates for lower yield.

It is true that tomatoes can be sown in mid-April and the seedlings will survive unless the frosts of May are severe. In early May 1945, seedlings in western Ohio survived a temperature of 29° F. and were damaged by 28° F. (Temperature recorded in standard Weather Bureau shelter, not actually close to seedlings). The principal difficulty in actual practice is not frost but weeds. Tomato seeds barely germinate at 50°, and grow only slowly at 55° F. Some weeds grow more rapidly and consequently outgrow the tomato seedlings. It is then very laborious to hoe out the weeds by hand, and the farmer simply disks up the planting and sets the field with transplants. In the writer's observations, more than half of the direct-seeded fields in western Ohio in 1945 were disked up and reset.

The possibilities of direct seeding have not as yet been critically studied in Ohio. Results of the tests shown in Fig. 2 and 3 indicate that seeding should be deferred until the soil is about 55° F. and that some phosphate fertilizer is needed, placed either directly in the row or not far from the seeds. Other tests indicate that the seedlings are very sensitive to the more soluble fertilizer constituents, hence any application of mixed fertilizer should

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Dairy stock graze a good improved pasture on land retired from cultivation. This pasture contains lespedeza and white dutch clover. It has been fertilized with 40 pounds of muriate of potash, a ton of lime, and 300 pounds of a mixture of nitrogen and phosphate per acre.

Pasture Possibilities On Coastal Plain Hills

By Lester L. Loftin

Soil Conservation Service, Western Gulf Region, Fort Worth, Texas

THE experience of E. H. Lumpkin, dairyman of Minden, Louisiana, is proof that improved pastures can be developed profitably on Louisiana and Texas hill soils if they are built in the right way and maintained properly. Lumpkin has converted what used to be an average hill-land pasture with a carrying capacity of 7 acres for each animal to one with a carrying capacity of 1½ acres for each animal. His improvement practices have also increased the number of months out of each year that his pasture furnishes grazing.

With the help of Soil Conservation Service technicians assisting cooperators of the Dorcheat Soil Conservation District in pasture establishment and maintenance, Lumpkin has developed a very profitable enterprise out of his 135 acres of clover—grass and lespedeza—grass pastures. According to a recent report on a number of dairy farms in Louisiana, made by the USDA, Bureau of Dairy Industry, Lumpkin made a higher income for each dollar of capital invested in his dairy than any of the other operators. In another survey by the Bureau of Dairy Industry, Lumpkin had the second highest rate of profit on milk above the cost of feed required to produce this milk.

"The most important thing I did to bring about these results was to improve my pastures," Lumpkin says. "At one time I regarded my pasture land as being more or less waste land. I have converted this supposed 'waste land'

into the most profitable land on my farm by following the recommended practices for pasture improvement. I have spent a great deal of money for lime, fertilizer, and seed, but I find that no other method of providing feed for livestock offers as great a return on the investment as improved pastures."

Building improved pastures of the sort Lumpkin has developed is a highly specialized farming practice. It must be understood thoroughly before it can be carried out successfully, he says. Lumpkin thinks pastures should be looked upon as a means of producing feed for animals the same as corn, hay, or any other feed crop.

The hill soils of the coastal plain region of northwest Louisiana and east Texas are inherently low in fertility. It takes a great deal of fertilizer to correct that condition. A check on about 500 soils samples, taken throughout Lumpkin's part of the State, shows that most of the hill soils there lack nitrogen, phosphorus, potassium, and calcium. The average amounts of phosphorus and potassium available for plants are less than half their minimum requirements for proper growth. The amount of calcium lime available was found too low in many cases to allow pasture plants to furnish bone-building qualities to the animals which eat them.

The average fertilizer recommendations made by the Louisiana Agricultural Experiment Station Soils Laboratory for a clover grass pasture on soils like Lumpkin's are 400 to 500 pounds of 20 per cent phosphate; 80 to 100 pounds of 50 per cent potash, and 1,000 to 3,000 pounds of lime an acre. The Soils Laboratory also recommends that these amounts be supplemented by liberal applications of additional phosphate and potash each year and periodic applications of lime.

If the land to be developed into improved pasture has been in cultivation for many years and the organic matter is depleted, barnyard manure needs to be added, legumes planted and plowed under, or some other method used to build up the organic content of the soil. A commercial fertilizer containing nitrogen is also a great help in getting grasses and clovers started in an improved pasture.

Proper fertilization causes two important changes in pastures: First, yields of both grasses and legumes are

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Erosion conditions have necessitated taking many Louisiana acres out of cultivation. Land of this sort can be utilized best as pasture in most localities.

Soil Conservation Service Photo

Lime and high-potash (8-16-16) fertilizer have produced good feed on this New England pasture; the cows know it.

The Story of Potash

By A. B. Beaumont

State College of Agriculture, Amherst, Massachusetts

FROM the precarious condition and doubtful prospects of a weak and unwanted infant to the full stature of a giant among the family of industrial chemicals has been the record of potash during the past 100 years. The story of potash has been told a number of times, but it has so much of interest and so many facets it will bear retelling, even at the risk of some repetition. It is interwoven with the story of the progress of the science of plant nutrition, practical crop production, and chemical technology. Wartime demands for increased food production only served to emphasize the importance of this element of nutrition.

Liberated in elementary form from one of its compounds in 1807 by Sir Humphrey Davy and discovered in large quantity in form of its soluble salts a quarter century later, potassium now occupies one of the leading positions among chemical elements in the world's commerce and industry. With some 90 per cent being used for fertilizer, agriculture easily gets the lion's share of the world's production of potash. The chloride, or muriate, is the principal form used in this way, although the sulfate and other potash salts are employed to some extent, mostly for specialized crops. The chloride, sulfate, chlorate, carbonate, and hydroxide, as well as smaller amounts of other potassium compounds, are used by the chemical and process industries. The hydroxide and carbonate forms are used as starting points in the manufacture of many chemicals important in the laboratory and technical processes, and in the mak-

ing of soft soaps, pharmaceuticals, dyes, glass, and matches.

No one knows when or where farmers first learned that potash-containing materials helped the growth of plants. It is known that American Indians early discovered that plants grew better on spots where fires had burned, and in Europe and Asia wood ashes have been used for centuries to improve garden soils. There was a traffic in wood ashes for fertilizer as early as 1750 in which, according to the late Sir A. Daniel Hall, ashes produced from bean straw were sold for top-dressing grassland. Before the exploitation of the German potash deposits, commercial sources of potash consisted mainly of the "salt gardens" on the coast of France, in which potassic and other salts were made by evaporating ocean water, and wood ashes which were used as a soil amendment or leached for potash. Some crude potassium nitrate, made from niter beds, was imported from India.

The Mining of Potash

The German potash mines, whose product for nearly three quarters of a century dominated the world's potash trade, were discovered accidentally a century ago. At the quaint old town of Stassfurt in Saxony, which dates back to 806 A. D., the Prussian government in 1839 started drilling to see if workable deposits of common salt could be found. Deposits of this material deep in the earth were suspected at this place because for years common salt had been made here by evaporating salt brines obtained from springs and wells. Discovery of salt deposits in the Thuringian Basin, south of the Harz Mountains, had rendered the manufacture of salt from the weak brines of Stassfurt non-lucrative. When in 1843, at a depth of about 800 feet, a layer of salt containing considerable potassium and magnesium chlorides was found instead of pure sodium chloride which was sought, there was great disappointment.

For a number of years after the discovery of the Stassfurt deposits, little value was attached to them since their great importance to agriculture was neither appreciated nor known. After a time, however, potash began to be extracted on a small scale for use in various chemical industries. In the meantime, Liebig and others demonstrated the importance of potash in plant nutrition. Liebig was the proponent and able champion of the "mineral" theory, which emphasized the value of the so-called mineral elements, particularly potassium and phosphorus, for this purpose. He invented a patent manure of compounds of these elements but made the mistake of fusing the mixture with lime and calcium phosphate so that it would not too readily be leached from the soil. Although Liebig's emphasis on the value of the minerals in plant nutrition was a distinct service to agriculture, his misconception of the necessity of supplying nitrogen to crops and the vigor with which he affirmed it were a disservice.

In 1861 the mining of potash salts at Stassfurt began and steadily increased thereafter, until by the turn of the century something over one million tons of potash were being produced by German mines, and most of it was being used for agriculture. Until the beginning of World War I, Germany had a virtual monopoly on international potash trade, although workable deposits were known to exist in Alsace, Spain, and elsewhere. When the German supply of potash was cut off in 1915, the price in this country skyrocketed from $35 to $350 or more per ton for 50% goods. This was too much for the American pocketbook and caused fertilizer manufacturers to say, "Never again." Immediately steps were taken to develop American sources of potash known to exist, and by the opening of World War II domestic sources were well developed. Now, the United States has even become an exporter of potash on a small scale.

A story within a story is the potash history of Searles Lake, California.

Soil Conservation Service Photo

A 483-bushel-per-acre yield of potatoes on a New Hampshire farm shows what can be done with high-potash fertilizer (8-20-12) and soil conservation practices.

When in 1863 John W. Searles, a hardy prospector, for whom the lake was named, first viewed this briny water, little did he envision the modern industrial development now to be seen there. He staked out a claim and by crude methods prepared borax from the brine. In 1911 investigators from the U. S. Geological Survey and the Bureau of Soils found that the brine contained 34% of salts, of which 13% was potassium chloride and the remainder sodium salts of which the tetraborate, or borax, is the most valuable. The production of finished products at the ultramodern plant at Trona is one of the outstanding triumphs of the application of phase-rule chemistry. Dr. J. W. Turrentine writing in 1941 of the romance of Searles Lake states that when he first visited the plant in 1913, it could be reached "only by automobile over roads which were little more than desert tracks cut through mesquite and consisted of a crude work camp into which even water had to be hauled with trucks. Here now stands a chemical plant of great size, its process devised in terms of the intricacies of phase-rule chemistry, yet mechanized to the point of practical operation—robots functioning in response to the slightest changes in temperature and concentration. It is surrounded by a village green with tamarisk hedges and providing all the modern facilities of comfortable living, accessible by concrete highways instead of sand ruts of 28 years ago."

Although Searles Lake was the first outstanding potash producer of domestic potash and really "saved the day" for American consumers at a critical time, the greatest strides in potash production have been taken at Carlsbad, New Mexico, since 1926. For some time geologists had been aware that in the great Permiam Basin of the Southwest, characterized by deep, brick-red, laminated deposits, which strikingly catch the eye of the tourist, there were salt deposits. Sporadic borings had shown the presence of potash salts. In 1926, agents of the federal government found commercial deposits of sylvinite and halite near Carlsbad. Later investigators from federal and private agencies revealed at a depth of 1,000 feet a deposit of sylvinite equal to the best in Europe. The Carlsbad potash mines represent the nearest approach

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On the Walter Olson farm, Union County, South Dakota, in 1945, oats fertilized with nitrogen, phosphorus, and potash yielded 90 bushels per acre. The unfertilized yield was 40 bushels per acre.

Field Trials With Fertilizers In South Dakota—1945

By W. W. Worzella and Leo F. Puhr

Department of Agronomy, South Dakota State College, Brookings, S. Dak.

SUCCESSFUL agriculture is dependent upon the maintenance of soil fertility. The problem of maintaining the fertility of our soils is not new. Since the early settlers first tilled the soil, more fertility or plant food has been taken out of the soil than has been returned through soil-building practices. The high productivity of virgin soils has been attributed to their higher content of plant food and organic matter. Continuous cropping has depleted our soils of a considerable portion of their original plant food. This is especially true for the plant-food elements nitrogen and phosphorus.

Maintenance of the productive capacity of the soil requires the restoration of plant food through soil-improvement practices which include returning manure, crop residues, plowing under legume crops, and the application of fertilizer. Of the 10 primary elements essential for the growth of crops, only three may be deficient in soils, nitrogen, phosphorus, and potash. These elements or plant-food materials occur naturally in the soil in varying amounts, depending upon the type of soil and past soil-management practices. When the fertility of the soil is not high enough for maximum crop production, plant food may be added by the application of fertilizers. In order to determine the kind and quantity of plant food to apply to the soil, it is necessary to conduct field trials with fertilizers.

Therefore, experiments are being conducted on different soil types and with different crops to determine the fertilizer need of South Dakota soils.

Experimental Procedure

In 1945 field experiments were conducted on private farms in order to study the effect of the application of plant food in the form of fertilizer on the yields of crops. Soil fertility plots were located in 15 counties. The plots were so distributed that the locations would be representative of the major crop and soil areas. County Agents and Soil Conservation Service assisted in locating and making arrangements with the farm cooperators.

These plots were established on private farms by arrangement with the owner of the farm. The entire field including the plot is farmed in the usual manner by the farmer and the plots received no special cultural practices except the application of the fertilizer. The fertilizer applications and the samples of the crop taken for yield were made by members of the Experiment Station staff. From time to time during the growing season the plots were inspected to note the condition of the crop or any damage which may have occurred due to insects, hail, or excessive water, etc.

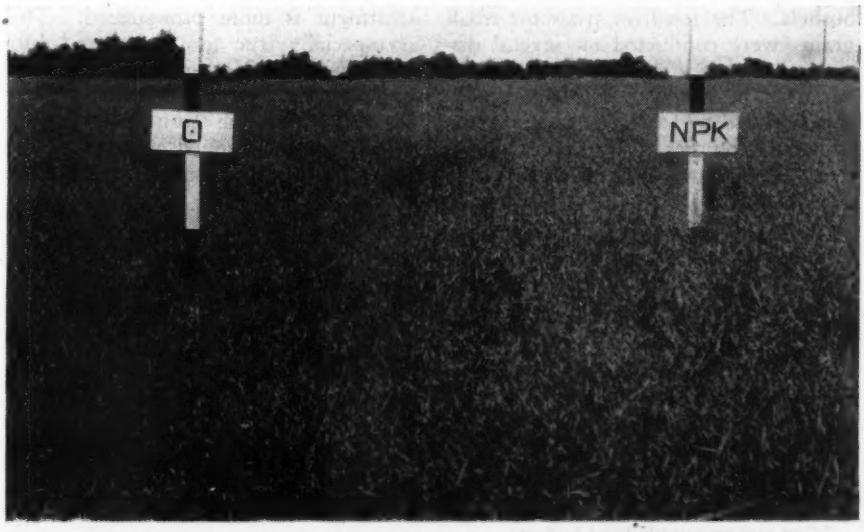
Fertilizers and Rate of Application

The plant-food elements, nitrogen, phosphorus, and potash, are the principal elements which enter into the make-up of commercial fertilizers. These three elements are sometimes called the primary elements of plant food because they are used heavily in crop production and may become deficient in soils. These elements may occur singly or in combination in commercial fertilizers. If all three elements enter into the composition of the fertilizer it is known as a complete fertilizer.

The plant food was applied to the fertilizer test plots in the following forms: nitrogen in ammonium sulphate, phosphorus in treble superphosphate, and potash in muriate of potash. The rates were 100 pounds ammonium sulphate, 100 pounds treble superphosphate, and 50 pounds muriate of potash, respectively per acre. The same rates were used whether the fertilizer was applied alone or in combination.

Fertilizers for Small Grains

The influence of various fertilizer treatments on the yields of small grains



On the Chris Anderson farm, Fairview, South Dakota, the fertilized oats yielded 78 bushels per acre as compared with 38 bushels for the unfertilized.

TABLE 1.—SMALL GRAIN YIELDS IN BUSHELS PER ACRE ON FERTILITY PLOTS

Treatment*	Rye	Barley	Wheat		Oats				
	Grant County	Day County	Grant County	Day County	McCook County	Clay County	Union County	Lincoln County	Average for Oats
None	21	37	39	23	81	61	40	38	55.0
N	22	47	42	29	69	75	56	62	65.5
P	27	46	42	32	88	59	58	38	60.7
K	26	39	42	28	92	61	47	39	59.7
NP	27	52	42	35	92	82	90	64	82.0
NPK	29	53	43	35	97	80	90	78	86.2

* N—Nitrogen, P—Phosphorus, K—Potash.

is shown in Table 1. Increases in the yields of small grains followed the application of fertilizer containing nitrogen and phosphorus.

While either nitrogen or phosphorus alone increased the yield, the largest increases were obtained when the two elements were applied together. In some instances potash gave some increase in grain yields, but the data indicate that South Dakota soils are relatively well supplied with potash for small grain production. For the oats crop the average increase in yield following nitrogen-phosphorus was 27 bushels and following nitrogen-phosphorus-potash the increase was 31.2 bushels. The fertilizer trials for small grains were conducted on several distinct soil types having considerable variation in fertility. For this reason the response to fertilizer varies in the different counties. The soils which were deep, dark, and level gave the least response, while the shallower, lighter colored soils developed on rolling land gave the most response. For this reason it will be necessary for farmers to be guided by the condition of their soil in determining the kind and quantity of fertilizer to be used on the small grain crop.

Fertilizers for Corn

The effect of fertilizer treatments on the yields of corn are given in Table 2. The largest increases in yield were obtained when the fertilizer treatment included nitrogen-phosphorus-potash. In the counties where corn reached maturity the effect of fertilizer treatment is more pronounced. This is especially true for Union and Lincoln counties. Nitrogen or phosphorus applied alone gave increases in every county where the corn ripened normally. Potash applied alone gave very little if any increase on corn. The

TABLE 2.—CORN YIELDS IN BUSHELS PER ACRE ON FERTILITY PLOTS

Treatment	Clay* County	Union County	Lincoln County	McCook County	Moody* County	Grant County	Average Bu./Acre
None	65	63	42	41	32	54	49.5
N	71	75	61	45	30	55	56.2
P	75	78	47	47	36	58	56.8
K	63	67	45	43	30	49	49.5
NP	60	85	55	48	33	59	56.7
NPK	69	80	61	51	34	64	59.8

* Corn very prematurely killed by frost.

TABLE 3.—POTATO YIELDS ON FERTILITY PLOTS

Treatment	Hamlin County	Codington County	Clark County	Average Bushels/Acre
	Bushels	Bushels	Bushels	
None	168	199	118	161.7
N	167	214	160	180.3
P	228	267	171	222.0
K	196	268	144	202.7
NP	248	287	174	236.3
NPK	260	298	175	244.3

average increase in corn yields for all counties was 7.2 bushels for nitrogen-phosphorus and 10.3 bushels for nitrogen-phosphorus-potash.

Fertilizers for Potatoes

Data in Table 3 give the results of fertilizer trials for potatoes. Each of the three major elements of plant food —nitrogen, phosphorus, and potash— increased the yields of potatoes when applied alone or in combination. However, the largest increases in yield were obtained by a combination of nitrogen-phosphorus and nitrogen-phosphorus-potash.

Yields of Hay and Grass Seed

The yields of hay and grass seed from variously fertilized plots may be

TABLE 4.—HAY YIELDS ON FERTILITY PLOTS

Treatment	Crested wheatgrass	Ree wheatgrass	Smooth bromegrass		Average Pounds/Acre
	Jackson County	Brookings County	Hand County	Deuel County	
	Pounds	Pounds	Pounds	Pounds	
None	748	4483	1625	1001	1964
N	1012	5450	1957	1717	2534
2N	1504	5266	3250	2353	3093
NP	1189	4702	2335	2097	2581
2NP	1388	5302	3223	3046	3240

TABLE 5.—GRASS SEED YIELDS ON FERTILITY PLOTS

Treatment	Crested wheatgrass	Ree wheatgrass	Smooth bromegrass		Average Pounds/Acre
	Jackson County	Brookings County	Hand County	Deuel County	
	Pounds	Pounds	Pounds	Pounds	
None	32	39	2	255	82.0
N	87	59	21	299	116.5
2N	124	59	60	419	165.5
NP	70	42	29	366	126.7
2NP	104	75	41	408	157.0

TABLE 6.—METHOD OF APPLYING FERTILIZER FOR CORN IN BROOKINGS COUNTY

Method of Applying Fertilizer *	Average Yield Bushels Acre
None	30.1
Broadcast on surface and disked in	36.0
Corn planter attachment	34.7
Broadcast on surface and plowed under	42.8
In plow furrow with plow attachment	45.8

* 250 pounds of 10-12-6 analysis fertilizer per acre were used.

seen in Tables 4 and 5. The application of nitrogen had the greatest effect on increasing hay yields. The heavier application of nitrogen produced the largest returns. Phosphorus was helpful only in Deuel county on the bromegrass. Grass seed yields were increased only with nitrogen fertilizer.

Methods of Applying Fertilizer for Corn

The effect of method of fertilizer application to crops is of considerable importance. In Table 6 are presented the results of various methods of applying fertilizer to the corn crop. The amount and kind of fertilizer applied was the same for each treatment. The results of this test for one year show that the placement of fertilizer in a narrow band in the plow sole with a fertilizer attachment on the plow is superior to all other methods. This method of application has the distinct advantage of placing the fertilizer where the soil is usually moist and where the plant roots may easily reach the fertilizer. The corn planter attachment which places the fertilizer close to the soil surface near each hill was found to be the least effective.

Fertilizers on Subsoil for Corn

It is frequently necessary to level land before irrigation practices can be carried out. This process results in removing the surface soil and exposing the subsoil. The subsoil is lacking in nitrogen and available phosphorus. In Table 7 are presented the effects of various soil treatments on the yields of corn. The data indicate that soil treatments which return nitrogen and phosphorus either in commercial fertilizer or manure are very effective in increasing the yields of crops growing on the subsoil.

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TABLE 7.—YIELD OF CORN UNDER IRRIGATION ON SUBSOIL IN LAWRENCE COUNTY

Treatment*	Average yield in bushels per acre on 15% moisture basis
No treatment	6.7
Nitrogen	4.5
Nitrogen-Phosphorus	51.1
Nitrogen-Phosphorus-Potash	40.4
¾ NPK + ¼ Manure	45.2
½ NPK + ½ Manure	39.2
Manure	41.8

* Manure applied at the rate of 25 tons/acre, ammonium sulphate 300 pounds, treble superphosphate 200 pounds, and potash 100 pounds.

This Louisiana French farmer and his wife cultivated and harvested nine acres of sweet potatoes which brought them over $3,500.

Sweet Potatoes Are Proving New Gold For The South

By Fred J. Hurst

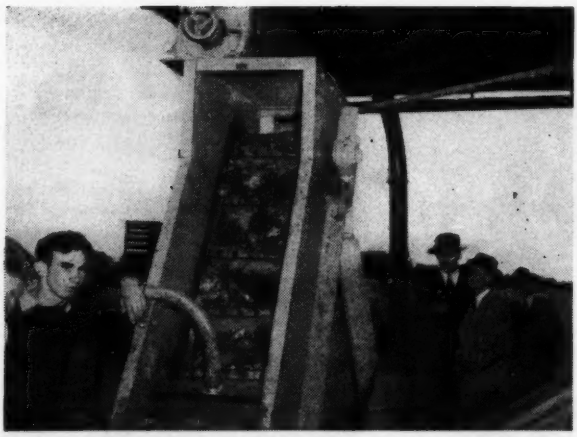
Farm Credit Administration, New Orleans, Louisiana

FOR thousands of southern farmers the long search for a crop to supplement cotton, produce more food, and improve income has ended. In the production of Unit One Porto Rico sweet potatoes, farmers have found a veritable gold mine. At the same time they are heaping up the nation's food supply and pouring new wealth into the channels of trade.

The richest "strike" has been in Louisiana. Production of sweet potatoes in the Bayou State is now big business. Marketings from the 1945 crop by truck and rail will total more than 6,000,000 bushels. Up to January 30, rail shipments alone totaled 6,356 carloads. Hundreds of thousands of bushels have been moved by truck. And hundreds of storage houses are still packed with potatoes. The volume now moving to market is limited only by the number of railroad cars available. Marketings will continue until June.

In addition, more than 25,000,000 pounds of dehydrated sweet potatoes have been exported under Lend-lease or shipped to American servicemen overseas. Large quantities of cull potatoes have been fed on the farm. The 1945 Louisiana crop is estimated at over 10,000,000 bushels, a gain of 2,724,000 bushels over the 1944 harvest.

Several other states produce about as many sweet potatoes as Louisiana, but the bulk of the crop is consumed on farms. Of the 9,832 carloads of sweet potatoes shipped to market from 15 states up to January 30, Louisiana



Showing washer-elevator at Perry, Georgia. The potatoes are washed, crushed, dried, and sacked.

shipped 6,356, or more than all the other states combined.

Through most of November and all of December and January, U. S. No. 1 and U. S. No. 1 and No. 2 mixed sweet potatoes sold at the ceiling price of $3.08 per bushel f.o.b. shipping point, and growers could not supply the demand.

With yields ranging from 150 to 250 bushels per acre in the commercial-producing areas like Lafayette, St. Landry, West Feliciana, and West Carroll Parishes, a veritable stream of gold was pouring into the State. At Sunset for example, a small town of 500 people in St. Landry Parish, local bank deposits passed the $3,000,000 mark, business flourished, and farmers were prosperous. In many other communities, the story is the same.

At St. Francisville, Opelousas, Sunset, and Carencro, Louisiana; Cullman, Alabama; and Perry, Georgia, dehydrating plants turned out sweet potato feed that found a ready market and met a local need for more carbohydrate feed. Experienced growers on adapted land are producing a good cash crop of No. 1 sweet potatoes for direct shipment to market, selling No. 2's to local plants for processing for food, and then harvesting cull potatoes equivalent to the feed value of an acre of corn.

The dehydrated potato feed is palatable, nutritious, easy to store, not subject to weevil injury and deterioration, and is high in vitamin content.

Feeding tests conducted by the Louisiana, Alabama, and Georgia experiment stations show that dried sweet potatoes are about equal to corn in feeding value. These results have led research authorities to predict that in a few years dehydrating plants for drying sweet potatoes will become as common as cotton gins and southern farmers will produce more of their needed carbohydrate feed.

During the past harvesting and marketing season, we visited the main commercial sweet potato growing areas in Louisiana, Mississippi, Alabama, and Georgia. On a 2,500-mile trip we talked with farmers, county agents, shippers, processors, and experiment station workers about growing, harvesting, processing, feeding, and marketing sweet potatoes.

All across these states everyone agreed that the need for greater farm diversification, the wartime demand for food, the breeding of better varieties, the development of modern methods of processing, and especially improvements in marketing and higher prices had brought farmers to a realization of the possibilities of sweet potatoes, where suitable soil is available and the crop is properly fitted in with other farm enterprises to provide desirable crop rotations and spread work throughout the whole year.

In all of the commercial areas, farmers are increasing production of sweet potatoes for food, for feed, and for industry. Growers and shippers are building more curing houses. More dehydration plants will be established in 1946. New mammoth size canning plants will be built. Producers are organizing to make further improve-

ments in production and marketing. Whole counties and parishes are growing a single variety to produce more uniform, higher quality sweet potatoes. Some shippers have already tried marketing sweet potatoes in open mesh five-pound bags. The innovation has proved popular with city housewives.

Last year a $7,000,000 starch factory was built at Clewiston, Florida. Owners of one of the largest distilleries in the United States, who cooperated with Louisiana State University in testing the value of sweet potatoes for producing alcohol, announced that 56 pounds of dehydrated Porto Rico sweet potatoes produced 4.85 gallons of 190-proof alcohol and 56 pounds of Pelican Processor, a high starch variety, produced 5.44 gallons of 190-proof alcohol which graded higher than grain alcohol.

Louisiana State University found golden yellow sweet potato meal an excellent mix for making ice cream. The potato meal added plenty of rich color and increased the vitamin content of the cream. At Auburn, Alabama, where the experiment station established a small pilot plant and pioneered in making breakfast foods and other commercial products from sweet potatoes, a private company is now manufacturing sweet potato-cocoanut candy on a commercial scale. All of these developments indicate the growing importance of sweet potatoes in southern postwar agriculture and industry.

For the most spectacular development of sweet potatoes as a money crop, we cite the record of West Carroll Parish, Louisiana. In 1942 a few growers around Oak Grove were induced to plant a few acres of sweet potatoes for market. They produced and sold $10,000 worth of potatoes. The per-acre return was high.

In 1943, more farmers planted sweet potatoes. The acreage and production were increased. Sales of sweet potatoes jumped to $90,000. With two years of satisfactory returns behind them and an urgent wartime demand facing them, more farmers planted sweet potatoes in 1944. Marketings climbed to $250,000.

In the meantime, the Warriner Starch Company of St. Francisville built a 400,000-bushel capacity storage house at Oak Grove and in 1945 contracted with 1,040 farmers to grow around 5,000 acres of sweet potatoes. The crop brought growers approximately $1,000,000. Davie Pierce, business leader of Oak Grove and sponsor of the sweet potato program, reported that 23,000 acres of cotton in the parish brought producers only $1,500,000.

At the height of the marketing season it was impossible for Warriner Starch Company to handle promptly all of the sweet potatoes delivered to their storage plant and wagons and trucks blocked the town as growers waited to weigh and unload their potatoes. A big buyer in Texas who had a contract with the Government to dehydrate a lot of sweet potatoes was called in to help. Railroad cars were placed at all loading stations in the parish, potatoes were loaded in the cars in

Sweet potatoes are carefully sorted and graded to meet an increasing demand on the market.

bulk, and in a few days the situation was relieved.

Mr. Pierce likes to tell the story of Wesley Parker, a sharecropper of Pioneer, Louisiana. Wesley is said to be one of the best farmers in the parish. But he believed in sticking to cotton. To get him to try sweet potatoes his landlord had to guarantee Wesley that he would at least make as much money from an acre of sweet potatoes as he made from an acre of cotton.

In each of four years Wesley made more net money from sweet potatoes than from cotton. In 1945 he had 5 acres in potatoes and 7 acres in cotton. His No. 1 potatoes from 5 acres brought him $1,870; cotton from 7 acres brought him $878. He still has his No. 2 potatoes to sell.

And there is the story of Mece Stanford, who produced and sold $1,600 worth of cotton from 14 acres, but who pocketed $2,100 from sales of sweet potatoes from 7 acres.

How Many Acres?

The problem in West Carroll Parish now is to keep farmers from planting too large an acreage in sweet potatoes. Growers are urged not to plant more than one-fourth to one-third of their cultivated land in sweet potatoes and not to plant potatoes on the same land more than once in three years.

The growers are planting Unit One Porto Rico and Queen Mary, superior varieties developed by Dr. Miller, and they are following the recommendations of the state experiment station in planting, fertilizing, cultivating, and harvesting. Much of the soil in the parish is well suited to production of sweet potatoes, and the producers use 400 to 600 pounds of 4-12-4 or 4-12-8 fertilizer per acre to get high yields. The liberal application of high analysis fertilizers is one of the most profitable practices in producing sweet potatoes. The use of right amounts of potash is especially important.

One concern alone plans to install five dehydrating plants in West Carroll Parish in 1946 to dehydrate cull sweet potatoes for feed. A plant will be established in each of the five wards of the parish to place them close to farmers and reduce the length of the haul. The company also plans to build a large sweet potato canning plant at Oak Grove.

In West Feliciana Parish growers last year produced a half million bushels of sweet potatoes for market. The Warriner Starch Company with two large storage houses and food and feed dehydrating units and a canning factory at St. Francisville, and storage and shipping facilities at Epps, Jonesboro, and Oak Grove, Louisiana and Eudora, Arkansas, marketed several hundred cars of No. 1 sweet potatoes, dehydrated 21,000,000 pounds of No. 2 potatoes for food, canned thousands of bushels, and processed a lot of culls for feed. Other buyers at St. Francisville offered needed competition in maintaining price levels.

St. Landry with 32,000 acres was the leading parish in Louisiana. At Opelousas, J. F. Dezauche, who has facilities for storing two million bushels of potatoes and operates a canning factory and dehydrating food and feed plants, bought 100,000,000 pounds of potatoes. He shipped potatoes in carload lots all over the United States.

Mr. Dezauche, who has been handling sweet potatoes for 35 years, emphasizes the importance of uniformity and high quality, which he says have been largely responsible for the fine reputation of and demand for Louisiana sweet potatoes.

The value of a strong farm cooperative in maintaining satisfactory prices, not only for its own members but for other farmers within the range of the co-op's influence, was again demonstrated in 1945 by the Sweet Potato Cooperative at Carencro. This association consistently paid its members more money for potatoes than buyers who did not have the competition offered by a producers' association.

The demand for the storage and marketing service given by the Car-

(*Turn to page* 47)

Fig. 1.—Corn grown on Tilsit silt loam in Laurel County, Kentucky, in a corn-wheat-mixed hay rotation where manure is applied for corn in amounts equal to the weight of crops removed. The limed plot on the left, fertilized with 400 pounds of 0-20-0 per acre for wheat, yielded 47 bushels of corn per acre; the unlimed, unfertilized plot on the right yielded 25 bushels.

Fertilizer Placement For Corn in Kentucky*

By G. L. Terman

Agricultural Experiment Station, Lexington, Kentucky

IN initiating studies of fertilizer placement for corn in 1944, the further need of data on different placements of equal amounts of plant food was kept in mind. Many purported tests of fertilizer placement have not really been tests of fertilizer placement. Some have been only a comparison of relatively large amounts of fertilizer plowed under or banded in the plow furrow with smaller amounts, usually applied at the row. A larger yield from the deep application, if obtained, does indicate successful response to a large application of fertilizer. It adds nothing, however, to our knowledge as to whether the same amount of fertilizer applied differently would have given equally good results.

Results from tests of different placements of an equal amount of plant food conducted in many states have been variable. Better results have usually been obtained from plowing under relatively large amounts of fertilizer for corn or placing it in bands in the plow furrow than from applications at the row or broadcast on the surface after plowing. These better results from deep application have usually been attributed to improved moisture

* The experiments reported in this paper were in connection with investigations by the Kentucky Agricultural Experiment Station and are published by permission of the director.

relationships beneath the surface. Poorer results from deep application, on the other hand, sometimes obtained on soils high in clay content or having poor structure, have been attributed by Hoffer (1) and others to poor aeration in the deeper root zone. Another important factor is the effect of the placement of the fertilizer on the date of tasseling and silking. Because of the pronounced effect of weather conditions at this time on corn yield, a slight advancement or retardation in maturity may markedly affect the final yield. With deep application, it has usually been found beneficial to reserve a part of the fertilizer for row application to stimulate early growth. This is especially desirable to allow earlier cultivation to control weeds.

Broadcasting fertilizer after plowing is objectionable because it stimulates growth of weeds. Banding of fertilizers, especially of phosphate and potash, whether applied at a deep or shallow depth, has usually been superior to broadcast application for the immediate crop. This is especially true of soils which have a high capacity for fixing phosphate and potash chemically in slowly available forms. In soils of low-fixing capacity, this is not so important. Fixation is undoubtedly a factor of major importance in explaining the difference in results of broadcast versus band application which have been obtained by different investigators and on various soil types. Too little attention apparently has been paid to soil texture, soil structure, aeration, soil-fixing capacity for phosphorus and potassium, adequate stands of corn, and climatic conditions in relation to tests of fertilizer placement.

When corn and other crops are grown in rotation, the total return from all crops must be considered in a fertilizer program. In most fertilizer placement tests it appears that too much emphasis has been placed on the effect of fertilizer on the immediate crop and too little emphasis on the effect on the crops of the rotation as a whole. It has been pointed out by McVickar and Gish (2) that although the response of the fertilized crop in a rotation to fertilizer is the greatest, the net effect on the rotation as a whole may be about the same, no matter where in the rotation the fertilizer is applied. In Kentucky where a rotation of corn, wheat, and hay has been used and manure returned for corn in amounts equivalent to the crops removed, ample evidence has been obtained showing (3) that it makes little difference as to corn yield whether fertilizer is applied for corn or for the wheat crop following.

1944 Tests

In 1944, six cooperative tests of placement of a complete fertilizer for corn were conducted. Fertilizer materials equivalent to 50 pounds of N, 40 pounds of P_2O_5, and 40 pounds of K_2O, or 500 pounds of 10-8-8 fertilizer per acre were applied in several different ways. Fertilizer mixtures were prepared from ammonium nitrate, superphosphate, and muriate of potash. A randomized arrangement of 1/80-acre plots was used. In addition to tests of placement of the complete fertilizer, these tests also included plots comparing 500 pounds per acre of 0-8-8, 10-0-8, and 10-8-0 fertilizer to determine which plant food was deficient in the soil.

The 1944 season in Kentucky was generally unfavorable for corn, although in some areas high yields were obtained. Drought and high temperatures at tasseling time resulted in poor pollination and consequently in low yields over much of the State. Drought injury, combined with the ever-present problem of soil variability, resulted in significant increases of ear corn from fertilizer, no matter how applied, in only one of the six tests. Actual decrease from fertilizer as compared with no fertilizer was obtained in some of the tests. This depression in yield probably resulted from early stimulation of corn growth by fertilizer and greater subsequent injury by drought. This view is substantiated by the fact that in all of the tests consistent, al-

TABLE 1.—YIELD OF EAR CORN FROM FERTILIZER OF DIFFERENT ANALYSIS AND PLACEMENT. MADISON COUNTY, KENTUCKY, 1944.

Amount and Placement of fertilizer [1]	Acre yield Bu.	Increase over no fertilizer
No fertilizer	64.8	.....
500 lbs. 0–8–8, F. B.	70.9	6.1
500 lbs. 10–0–8, F. B.	81.2	16.4
500 lbs. 10–8–0, F. B.	69.3	4.5
500 lbs. 10–8–8, F. B.	78.5	13.7
500 lbs. 10–8–8, B.P.U.	66.7	1.9
400 lbs. 10–8–8, F. B.; 100 lbs. 10–8–8, hill	75.1	10.3
500 lbs. 0–8–8, F. B.; 500 lbs. 10–0–0, hill	87.2	22.4
500 lbs. 10–8–8, hill	96.4	31.6
500 lbs. 10–8–8, B. D. I.	70.9	6.1
Significant difference	5.8	5.8

[1] F. B.=Bands in the plow furrow; hill=two 8-inch bands, 3 to 4 inches to side of and slightly below the seed; B. P. U.=broadcast and plowed under; B. D. I.=broadcast and disked in after plowing.

though in some cases small, increases in yield of stover were obtained.

Significant increases of ear corn from fertilizer were obtained in a test in Madison County. In Table 1 are given the yield data from this test, together with the various placements of fertilizer compared in all tests. In this test the single crosses WF9 x 38-11 and K4 x L317 for producing Ky 103 hybrid seed corn were grown, the female on the plots and the male on the trim rows between plots. This cross withstood severe drought in July and, with adequate rains in August, produced high yields. The soil on which this test was conducted was a silty clay loam. It was high in available phosphorus and calcium but low in available potassium.

In general, most response was obtained from potash. Application of the complete fertilizer in side bands at the hill or application of the nitrogen at the hill with furrow placement of the phosphate and potash gave best results. Deep placement, especially broadcasting and plowing under, gave poorer response. Lack of proper soil aeration may have been the major cause of poor response in this test.

1945 Tests

In 1945 the same general types of experiments with minor revisions were

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Fig. 2.—Corn grown on limed Grenada silt loam in Livingston County, Kentucky, in a corn-wheat-legume hay rotation, where no manure is applied. The plot on the left, fertilized at acre rates of 300 pounds of 7-0-3 for corn and 500 pounds of 5-0-15 for wheat, yielded 37 bushels of corn per acre; the plot on the right, fertilized with 200 pounds of 7-5-3 for corn and 500 pounds of 5-8-15 for wheat, yielded 55 bushels.

Aiming For Higher Goals

By J. C. Holm

Teacher of Vocational Agriculture, Lapaz, Indiana

BACK in 1938 when land was selling at low figures, I decided to purchase a small farm and make it pay. My friendly neighbors suggested that this land had been rented and robbed until it was no longer worth farming and soon another mortgage would be on this worn-out, clay-loam soil.

In order to verify the soil needs, we consider (1) the physical needs and (2) the chemical needs of the crops to be grown. Before purchasing the farm, my rapid soil-testing kit had given me a key which indicated needs as follows: Plenty of potash plus phosphate and lime to raise the pH to 6-7. Such plants as wheat and timothy were sown, thereby giving me the second key. For fall-sown wheat I used an 0-20-20 fertilizer, applying 200 lbs. per acre. The same fall I noticed the potash and phosphate deficiencies. In the case of potash shortage, one notices the leaf drying or burning back from the tip; the phosphate shortage shows up in beautiful purple leaf margins. The next spring I sowed into the wheat a mixture of red clover, alsike clover, timothy, and alfalfa with 0-20-20 at the rate of 200 lbs. per acre. The next season this field produced one of the finest stands of clover one would care to see, yielding from 40 to 50 tons from 11 acres.

After the crops responded to a reasonable amount of potash and phosphate, I decided to see how erroneous was the old theory of "too much good commercial fertilizer burns out the land," which in my case has proved to be just plain false economy. Corn yields on the land had been only 25 to 30 bu. per acre, and less during drought years. The yield of more than 100 bu. of corn per acre resulted from land that really underwent an intensive program of rebuilding. Potash and phosphate were applied liberally and proved indispensable.

Fertilizers cannot have their full effect on crop yields if the soil is too low in organic matter. This is best supplied by plowing under a good sod to which has been previously added 10-20 tons of fresh barn manure per acre. The manure is reinforced in the gutter with 0-20-0 or 0-45-0, about 20-30 lbs. per load. On some occasions, one or two gallons of 50% potash are placed on the load for special spots which are low in potash.

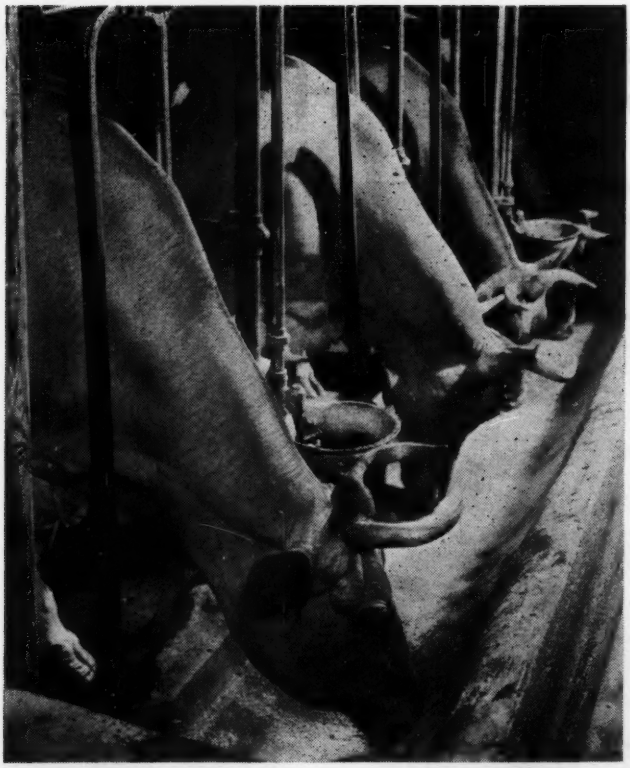
Improved Pastures

During the spring of 1945, I gave 12 acres of hay and pasture land a dose of phosphated manure plus some special treatment on some of the poorest spots. I used in the grain drill 100 lbs. 45% treble superphosphate and 200 lbs. of 50% muriate of potash per acre. This field made such rapid growth of a mixture of alfalfa, timothy, and clovers that it was necessary to split the field into five acres for 15 cows to pasture and seven acres for hay, which made 88 bales of 80 pounds per bale per acre. The cows had knee-deep pasture for 90 days and were fed grain in the barn at each milking. The five-acre pasture produced in milk sold for May, 12,633 lbs.; June, 11,844; and July, 10,764 lbs.; or in milk checks, net $330.41, $308.00, and $291.22, respectively, not including the $128.45 subsidy. Without balanced soil fertility, this field might keep one cow per 5 to 10 acres with low milk production because of low or poor plant growth. These five acres actually pro-

(*Turn to page* 41)

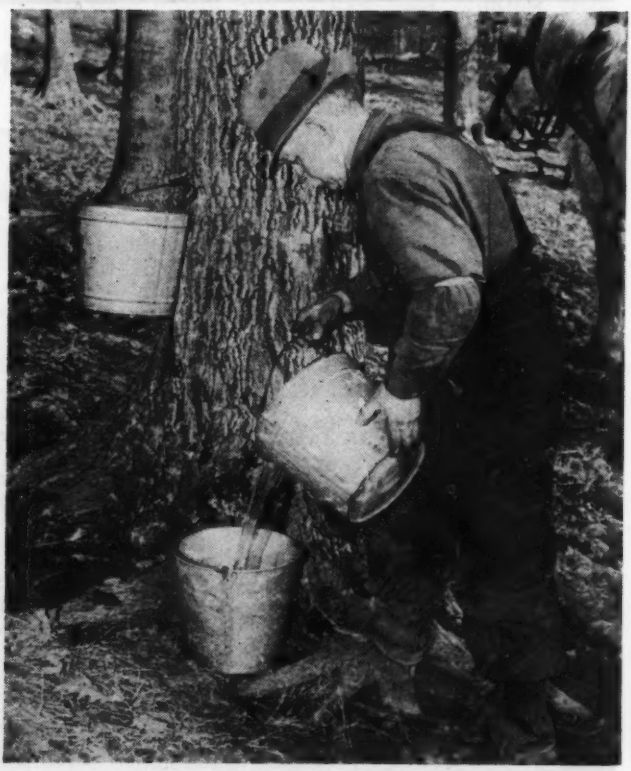
PICTORIAL

To Be Remembered on Hot Days



Left: Some animals are born to the silver platter.

Below: While others must work for their living.



Above: Sugar maples—favorite trees in early spring.

Right: Best weather for sap flow is cold, stormy, blustery.

Studies in Black and White

The Editors Talk

Convening Again

After a two-year lapse, caused by war-travel restrictions, the Nation's specialists in soils and crops convened in Columbus, Ohio, February 26 to March 1. Taking up again the major problems concerning crop production in its various aspects and the trends which have developed through the unprecedented demands on the Nation's agricultural producers, it was apparent that the role of science in agriculture is even more important now than it ever has been before. It was a welcome sight to see back in the meetings numerous scientists who had been with the military forces or utilizing their specialized knowledge in technical lines, and appropriate recognition was given these men.

In the general program of the Soil Science Society of America major attention was directed to the problems of managing our soils of the Midwest and South, and concern over maintaining the productivity in these—our principal crop-producing sections—was quite apparent. In this general meeting, Dr. W. H. Pierre of Iowa presented a paper on the future problems in the management of cornbelt soils; Dr. H. J. Harper of Oklahoma discussed soil conditions and the future of Great Plains agriculture; and Dr. R. W. Cummings of North Carolina presented the agronomic problems in the agricultural reconversion of the South. The address by the President of the Agronomy Society, Dr. F. W. Parker of the U. S. Department of Agriculture, dealt with the nitrogen problem in soil management.

Pasture fertilization and management came up for special attention with two group meetings devoted to the fertilization of pastures, grazing problems, and pasture plants—thus showing the increased appreciation of the importance of this phase of agricultural production, too often neglected in the past. It is becoming more and more apparent that our pastures represent an important cash crop instead of merely being waste land on which animals are turned to fend for themselves.

Plant breeders presented the advancements they are making in improving the strains of our principal field crops. The amazing advances made in the production of hybrid corn have almost over-shadowed the progress constantly being made in other crops, such as oats, cotton, and forage plants. A whole session was devoted to a symposium on hard red winter wheat improvement. More and more soils and crops men are finding that for maximum results they must work together so as to realize the greatest possible benefits by supplying the increased plant-food needs of these improved varieties which make heavier drains on soil fertility. Conversely, it has been found that maximum realization of improved fertilization practices can be obtained only when the population of the soil, or stand per acre, is increased to the point where there are enough plants of high-producing capacity to utilize the additional fertilizer and thus capitalize on the increased potential producing ability per unit of land.

The broader aspects of agronomy in their relation to the future of this country

and also world conditions were not neglected. Sessions were devoted to the design of long-time experiments, to the problems of teaching agronomy, and soil conservation planning. At a general meeting of the Society as a whole the international opportunities and responsibilities of agronomists were discussed by Dr. P. V. Cardon of the U. S. Department of Agriculture and the domestic by Dr. Richard Bradfield of Cornell University. Problems of renewing contacts and exchange of ideas with agronomists in other countries and especially in war-torn Europe were given consideration. A committee was appointed to facilitate the resumption of such normal exchanges and to aid in re-establishing agronomic research in Europe.

Numerous specialized groups met for papers on peat and muck soils and on the problems of forest soils. As usual one whole day was devoted to fertilizer usage and placement from the more immediately practical aspects in contrast to the no less important but more scientific relationships presented in the other papers. These discussions were on a broad basis and reviewed trends in the use of commercial plant foods, the progress made in fertilizer application, the needed improvements in present application machinery, and the foreseeable progress that is desired and expected in the next few years on vegetable crops, field crops, pastures, and orchards.

As in previous years, it was satisfying to see the advancement of science turned to practical application on current problems. It is to be hoped that nothing will prevent the normal continuance of these meetings.

Victory Gardens

Garden tools are out, sun-burned faces are appearing, and lame muscles are slowing up the "zip" of urbanites—for "Victory" gardens have been declared no less important this year than during the past four years. And Secretary of Agriculture Anderson says they will still be called "Victory" gardens. Why change the name? The war is over but the victory is not complete and will not be complete until the wounds have been healed, the good earth is in full production again, and the starving victims of the war are eating regularly. Besides, victory gardens are household words throughout the land, a name worth millions as businessmen measure good will.

The world conditions from which the necessity for no let-down in gardening springs are to be deeply regretted. Yet necessities are necessities and in meeting them it always helps to survey the benefits which may be involved. That in this case they are many is seen in the countless numbers of urban home-owners who had already planned to continue their gardens. The fresh quality of the produce, the healthful exercise, the community spirit, the saving in food bills—all were holding over from the days when the rake and hoe helped in "doing his part."

Victory gardens should be continued long after the "wounds have been healed," for while they are helping to sustain lives, they will continue to enrich lives. A new and timely concern over proper nutrition has been instigated—timely in view of the shocking numbers of young men rejected for service in the armed forces of the "world's best-fed nation" because of ills arising from improper diets. Timely, too, is the immeasurable and stimulating new interest in agriculture and its problems—an interest sorely needed in a better understanding of the economic welfare of the Nation.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944	20.7	40.8	149.0	192.0	109.0	141.0	16.40	52.70	....
1945									
February	19.99	31.8	165.0	201.0	106.0	147.0	17.70	52.70	....
March	20.24	21.4	171.0	207.0	107.0	148.0	18.10	52.00	....
April	20.20	21.4	174.0	211.0	107.0	149.0	16.90	51.90	....
May	20.51	42.2	177.0	214.0	108.0	149.0	16.50	52.10	....
June	20.90	51.2	180.0	220.0	111.0	150.0	15.90	52.50	....
July	21.25	56.3	183.0	230.0	112.0	146.0	15.40	55.00	....
August	21.33	44.9	167.0	256.0	113.0	145.0	14.60	52.50	....
September	21.72	43.2	138.0	207.0	112.0	145.0	14.30	51.40	....
October	22.30	45.9	126.0	180.0	113.0	151.0	14.30	51.00	....
November	22.52	46.7	131.0	186.0	111.0	153.0	14.90	51.30	....
December	22.84	43.8	137.0	194.0	109.0	154.0	15.40	51.40	....
1946									
January	22.36	36.3	145.0	208.0	110.0	154.0	15.70	50.90	....
February	23.01	33.9	146.0	223.0	111.0	155.0	15.80	50.30	....
	Index Numbers (Aug. 1909—July 1914 = 100)								
1920	128	173	180	161	96	207	139	114	....
1921	137	195	163	129	81	117	98	129	....
1922	185	228	95	114	116	109	98	135	....
1923	231	190	133	137	129	105	110	183	....
1924	185	190	98	170	166	141	107	147	143
1925	158	168	245	188	109	163	108	140	143
1926	101	179	189	134	116	138	112	98	139
1927	163	207	146	124	132	135	87	154	127
1928	145	200	76	134	131	113	95	152	154
1929	135	183	189	133	124	117	92	137	137
1930	77	128	131	123	93	76	93	98	129
1931	46	82	66	83	50	44	73	40	115
1932	52	105	55	62	50	43	52	46	102
1933	82	130	118	79	81	84	68	57	91
1934	100	213	64	91	127	96	111	146	95
1935	90	184	85	80	102	94	63	135	119
1936	100	236	164	106	163	116	94	148	104
1937	68	204	76	93	81	109	74	87	110
1938	69	196	80	83	76	64	57	97	88
1939	73	154	100	85	88	78	67	94	91
1940	80	160	78	97	96	77	64	96	111
1941	137	264	116	107	117	107	81	211	129
1942	153	369	168	136	143	124	91	202	163
1943	160	405	188	232	174	154	125	231	245
1944	167	408	214	219	170	160	138	234	212
1945									
February	161	318	237	229	165	166	149	234	223
March	163	214	245	236	167	167	152	231	203
April	163	214	250	240	167	169	142	230	259
May	165	422	254	244	168	169	139	231	193
June	169	512	258	251	173	170	134	233	269
July	171	563	263	262	174	165	130	244	244
August	172	449	240	292	176	164	123	233	240
September	175	432	198	236	174	164	120	228	159
October	180	459	181	205	176	171	120	226	181
November	182	467	188	212	173	173	126	227	235
December	184	438	197	221	170	174	130	228	223
1946									
January	180	363	208	237	171	174	132	226	249
February	186	339	209	254	173	175	133	223	275

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.70	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
1943	1.75	1.42	6.30	5.77	3.34	4.86	6.62
1944	1.75	1.42	7.68	5.77	3.34	4.86	6.71
1945							
February	1.75	1.42	7.81	5.77	3.34	4.86	6.71
March	1.75	1.42	7.81	5.77	3.34	4.86	6.71
April	1.75	1.42	7.81	5.77	3.34	4.86	6.71
May	1.75	1.42	7.81	5.77	3.34	4.86	6.71
June	1.75	1.42	7.81	5.77	3.34	4.86	6.71
July	1.75	1.42	7.81	5.77	3.34	4.86	6.71
August	1.75	1.42	7.81	5.77	3.34	4.86	6.71
September	1.75	1.42	7.81	5.77	3.34	4.86	6.71
October	1.75	1.42	7.81	5.77	3.34	4.86	6.71
November	1.75	1.42	7.81	5.77	3.34	4.86	6.71
December	1.75	1.42	7.81	5.77	3.34	4.86	6.71
1946							
January	1.75	1.42	7.81	5.77	3.34	4.86	6.71
February	1.75	1.42	7.81	5.77	3.34	4.86	6.71
Index Numbers (1910-14 = 100)							
1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	146	129	139
1927	112	79	145	166	143	128	162
1938	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	12	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	131
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
1943	65	50	180	163	110	144	189
1944	65	50	219	163	110	144	191
1945							
February	65	50	223	163	110	144	191
March	65	50	223	163	110	144	191
April	65	50	223	163	110	144	191
May	65	50	223	163	110	144	191
June	65	50	223	163	110	144	191
July	65	50	223	163	110	144	191
August	65	50	223	163	110	144	191
September	65	50	223	163	110	144	191
October	65	50	223	163	110	144	191
November	65	50	223	163	110	144	191
December	65	50	223	163	110	144	191
1946							
January	65	50	223	163	110	144	191
February	65	50	223	163	110	144	191

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.525	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	15.17	.572	.623
1939	.478	1.90	5.50	.521	.751	24.52	.570	.670
1940	.516	1.90	5.50	.517	.730	24.75	.573	....
1941	.547	1.94	5.64	.522	.780	25.55	.570	....
1942	.600	2.13	6.29	.522	.810	25.74	.205	....
1943	.631	2.00	5.93	.522	.786	25.35	.195	....
1944	.645	2.10	6.10	.522	.777	25.35	.195	....
1945								
February	.650	2.20	6.13	.535	.797	26.00	.200	....
March	.650	2.20	6.20	.535	.797	26.00	.200	....
April	.650	2.20	6.20	.535	.797	26.00	.200	....
May	.650	2.20	6.20	.535	.797	26.00	.200	....
June	.650	2.20	6.20	.471	.701	22.88	.176	....
July	.650	2.20	6.20	.503	.749	24.44	.188	....
August	.650	2.20	6.20	.503	.749	24.44	.188	....
September	.650	2.20	6.20	.503	.749	24.44	.188	....
October	.650	2.20	6.28	.535	.797	26.00	.200	....
November	.650	2.20	6.40	.535	.797	26.00	.200	....
December	.650	2.20	6.40	.535	.797	26.00	.200	....
1946								
January	.650	2.20	6.40	.535	.797	26.00	.200	....
February	.650	2.20	6.40	.535	.797	26.00	.200	....
Index Numbers (1910-14 = 100)								
1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1924	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	....	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	110	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	102	87	....
1941	102	54	110	73	82	106	87	....
1942	112	59	129	73	85	106	84	....
1943	117	55	121	73	82	105	83	....
1944	120	58	125	73	82	105	83	....
1945								
February	121	61	126	75	84	108	83	....
March	121	61	127	75	84	108	83	....
April	121	61	127	75	84	108	83	....
May	121	61	127	75	84	108	83	....
June	121	61	127	66	74	95	80	....
July	121	61	127	70	79	101	82	....
August	121	61	127	70	79	101	82	....
September	121	61	127	70	79	101	82	....
October	121	61	129	75	84	108	83	....
November	121	61	131	75	84	108	83	....
December	121	61	131	75	84	108	83	....
1946								
January	121	61	131	75	84	108	83	....
February	121	61	131	75	84	108	83	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	150	94	57	160	117	77
1944.....	195	176	151	96	57	174	120	76
1945								
February..	199	179	153	97	57	175	121	78
March.....	198	180	153	97	57	175	121	78
April.....	203	180	154	97	57	175	121	78
May.....	200	180	154	97	57	175	121	78
June.....	206	180	155	95	57	175	121	69
July.....	206	180	154	96	57	175	121	74
August....	204	180	154	96	57	175	121	74
September.	197	181	153	96	57	175	121	74
October...	199	182	154	97	57	175	121	78
November.	205	182	156	97	57	175	121	78
December .	207	183	156	97	57	175	121	78
1946								
January...	206	184	156	97	57	175	121	78
February..	207	185	156	97	57	175	121	78

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.

**** The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

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"1945 Fertilizer Recommendations for Wheat, Other Fall-Sown Grains, and Permanent Pastures," Agr. Ext. Serv., Ohio State Univ., Columbus, Ohio, No. 257, Rev. July 1945, Earl Jones and Robert E. Yoder.

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"Brief Description of Kendall County Soils," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AG1188, Jan. 1944.

"Do Not Burn Crop Residues," Dept. of Agron., Univ. of Ill., Urbana, Ill., AG1202, Feb., 1944, L. B. Miller.

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As a man grows older and wiser, he talks less and says more.

The spread doesn't seem to wait for middle-age, anymore.

Seek Tests For Quality

The harvesting and field handling of an edible farm product—whether it is to be marketed fresh, frozen, canned, or dried—determines in large degree how acceptable the product will be to the consumer. Not only are chemical analyses and physical tests being made to determine changes in the product at various stages, but a considerable group of research workers are seeking objective tests to detect quality changes during handling. What the scientist is after is the translation of his research findings into readily applied, comparatively simple tests that can be used in industry as aids for control during harvesting, handling, and processing of the commodity.—*H. C. Diehl, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture.*

Aiming for Higher Goals

(*From page* 26)

duced 35,241 lbs. of milk, sold at $929.63 in 90 days.

My goal for 1946 is not for only 100 bu. of corn or three cows per acre, but with an abundance of balanced fertility, 10 lbs. of milk per acre daily or 400 lbs. of milk daily for 365 days. My aim shall be to make the corn, hay, small grain, and pasture, through the use of organic matter and lime, plus liberal amounts of potash and phosphate, produce milk, eggs, and meat that are high in minerals, proteins, carbohydrates, and vitamins for a better-nourished world.

Field Trials with Fertilizers in S. D.—1945

(*From page* 18)

Recommendations

The following general recommendations for fertilizer are made for South Dakota:

Crops	Amount per acre	Analysis
Small grains	100 to 150 lbs.	4-24-12 or 10-20-0
Corn	100 to 200 lbs.	4-24-12 or 10-20-0
Hay and pastures, and grass seeds	100 to 200 lbs.	20-0-0
Potatoes	300 to 500 lbs.	4-24-12

On soils prepared by leveling for irrigation heavy applications of fertilizer and manure must be used to produce a crop. About 200 to 400 pounds per acre of a complete fertilizer, containing a 10-10-5 analysis, plus manure and crop residues are recommended.

A combination of fertilizer-grain drill is recommended for applying fertilizers to small grains or grass seedings. For corn the placement of fertilizer in a narrow band in the plow sole with a fertilizer attachment on the plow has proven best. The corn planter attach-

ment was found to be least effective. For potatoes the fertilizer attachment on the planter or plow sole application with the attachment on the plow is the recommended method.

In conclusion, it should be emphasized that commercial fertilizers are not a substitute for other well-established soil-management practices. Crop rotations including legumes and grasses, the return of crop residues, and the use of manure supplemented with commercial fertilizers constitute good soil management.—*Agronomy Department Pamphlet No. 6.*

The Story of Potash

(*From page* 13)

in this country to the German industry. Carlsbad potash is not a by-product nor is there one associated with it. In fact, the Carlsbad ores are so free from impurities that some of them need only to be crushed for use as a fertilizer, although most of the output is refined in order to give a more concentrated product.

Thus, within a generation since American manufacturers and farmers were suddenly caught short of potash, a great industry for producing this important commodity has been created. Although, according to present estimates, America does not have as large deposits of soluble potash as do Germany and some other countries, we have enough to last many years at the present rate of consumption. There is no need to worry about the immediate future to say the least.

It is in the field of agriculture that the greatest strides have been made in the use of potash salts. From the consumption of a negligible amount to the use of more than half million tons for fertilizer alone within 100 years is fair progress. This progress has not been made without considerable effort

Tobacco plots, Massachusetts Experiment Station, 175 pounds potash per acre used. For Connecticut Valley tobacco 6-3-6 is a popular grade of fertilizer.

on the part of research and educational agencies. There was no prior demand for fertilizer potash awaiting the development of a supply. The demand was created largely after the material became available, first mainly on the strength of nutritional theory and later on the basis of experimental evidence.

There is now abundant proof that many soils require additions of soluble potash to supplement the meager supply of available native potash in order to produce optimum crop yields. Some soils, of course, respond better than others to such application, and there is also a difference in the requirements of crop plants. It has been found, for example, that till and outwash soils of the Northeastern glaciated region of the United States need fertilizer potash for the production of many crops, including hay and pasture grasses and clovers, corn, potatoes, tobacco, asparagus, onions, and most vegetables. Also, marked response to potash has been obtained from many crops on soils of the Atlantic and Gulf Coastal Plains, on the residual soils of the Piedmont, other sections of the South, and in some parts of the West. The full story of the role of potash in plant nutrition cannot yet be told; the romance is still unfolding.

Tomatoes Are a Field Crop in Western Ohio

(*From page* 8)

be carefully placed some distance laterally from the seed.

Today, the common method of seeding in Ohio is to apply the fertilizer with a corn planter to which is attached a trailing garden seeder. This improvised method can hardly be expected to place fertilizer properly for seeds that are sensitive to contact with the soluble constituents. Clearly, special planting equipment is needed if tomatoes are to be grown successfully and reliably from direct seedings in the field.

A Glance at the Future

As a whole, the growing of tomatoes for processing, as a farm crop on the fertile soils of western Ohio, seems to be an entirely sound economic practice. The production has trebled in the past 15 years, and the limit is not yet in sight. In 12 prominent tomato coun-

Fig. 3.—Superphosphate (20 per cent) placed in the row increased the growth of tomato seedlings in Brookston clay loam. Labels indicate the rate in pounds per acre if the rows had been five feet apart.

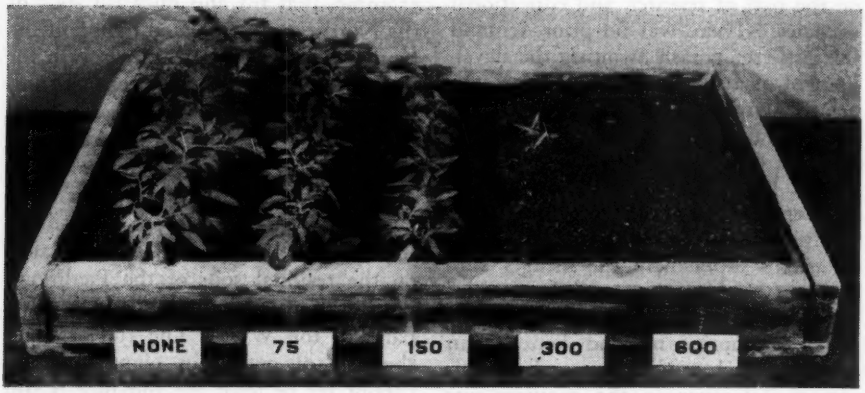

Fig. 4.—Sulphate of ammonia placed in two-inch bands about one-half inch under the seeds retarded germination and growth. Labels indicate the rate in pounds per acre if rows had been five feet apart. All rows in this flat received a uniform application of superphosphate at 300 pounds per acre.

ties, for example, the 1939 census reported 31,774 farms of which only 3,101 were growing tomatoes. This number has increased during war years but is probably still less than 4,000. In these 12 counties, then, not more than one farm in eight has been growing tomatoes in recent years. If factory capacity increases as it has in the past decade and if the farmer continues to find tomatoes more profitable per acre than field corn, there is every reason to predict that more farmers will grow tomatoes for processing in western Ohio.

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Fertilizer Placement for Corn in Kentucky

(*From page* 25)

conducted as in 1944. A systematic arrangement of two replications of 1/80-acre plots was used in which every fourth plot was an unfertilized check. Plant food equivalent to 625 pounds of 8-8-8, made up from ammonium nitrate, superphosphate, and muriate of potash, was compared in different placements. The tests included NP, NK, and PK mixtures to determine what plant food was limiting in the soil. Recommended varieties of hybrid corn were grown in all tests.

The 1945 season was generally favorable for corn throughout Kentucky, although drought limited yields in some areas. Marked increases in yield from fertilizer applications were obtained in five of the six placement tests conducted. These results are given in Table 3. In Table 2 are given the results from use of fertilizers of different analyses in five of the tests, together with a fertilizer test in McCracken County in which placement was not studied. Since this information is considered basic to an intelligent interpretation of results from tests of fertilizer placement, these results are discussed.

The first three tests listed in Table 2 were on soils along major rivers subject to flooding. These soils have been cropped almost continuously to corn for long periods with little or no application of manure or commercial fertilizers. Soybeans have been occasionally grown in rotation with corn and in a few years no crop was grown because of prolonged flooding. The soils at all three locations are depleted in nitrogen and organic matter because of cropping with soil-depleting crops. Chemical tests showed the soils to be very low in available potassium, extremely high in available phosphorus, and adequately supplied with calcium. The reason for the high content of phosphorus is difficult to explain considering the origin of these soils. Results from these tests indicate little or no response to phosphate and potash without nitrogen and in one case no response to nitrogen and phosphate without potash. Most response was obtained to the combination of nitrogen and potash, with some additional response to complete fertilization in two of the tests. In the Lyon County tests, much less response to fertilizer was obtained on land which floods frequently (No. 1) than on land which floods only occasionally (No. 2).

In the Christian County experiment, chemical tests showed the Hagerstown silt loam to be deficient in available phosphorus, but fairly well supplied with available potassium and calcium. The yield data indicate little response without phosphate, and best response to complete fertilizer. The soil in the Madison County experiment tested low in available phosphorus and potassium and was strongly acid. This soil had received some previous phosphate fertilization, and corn responded most to nitrogen, practically no response being obtained without it. The soil in the Grayson County test had been previously built up to a good level of fertility by application of phosphate and limestone and general good soil man-

TABLE 2.—YIELD OF EAR CORN FROM FERTILIZER OF DIFFERENT ANALYSIS, IN 1945. FERTILIZER WAS BROADCAST AND PLOWED UNDER IN ALL EXCEPT THE MCCRACKEN COUNTY TEST, WHERE IT WAS APPLIED IN ROW SIDE-BANDS.

Location of test and soil type	Average yield of unfertilized checks bu.	Av. increase over checks for fertilizer—Bu.			
		625 lbs. of 0–8–8 (PK)	625 lbs. of 8–0–8 (NK)	625 lbs. of 8–8–0 (NP)	625 lbs. of 8–8–8 (NPK)
River bottom silt loam soils					
Lyon County (1) (along Cumberland River)	55.5	−3.3	15.0	9.7	18.4
Lyon County (2) (along Cumberland River)	52.6	0.4	25.7	18.6	32.3
McCracken County (along Ohio River)	56.7	5.0	10.4	−0.8	10.9
Upland Soils					
Christian County (Hagerstown silt loam)	43.4	4.9	2.1	11.9	16.1
Grayson County (Tilsit silt loam)	47.6	2.9	1.5	7.0	5.3
Madison County (Johnsburg silt loam)	47.5	1.3	13.1	18.8	25.8

TABLE 3.—YIELD OF EAR CORN FROM DIFFERENT PLACEMENT OF FERTILIZER, 1945. AN EQUAL AMOUNT OF PLANT FOOD (625 POUNDS OF 8-8-8 FERTILIZER PER ACRE) WAS APPLIED IN DIFFERENT WAYS.

Location of test and soil type	Average yield of unfertilized checks bu.	Average increase over checks for fertilizer—Bu.				
		All broadcast and plowed under	500 lbs. broadcast and plowed under 125 lbs. at row	500 lbs. in furrow bands; 125 lbs. at row	All at the row	All broadcast after plowing and disked in
Lyon County (1) (along Cumberland River)	55.5	18.4	17.6	12.8	10.9	10.5
Lyon County (2) (along Cumberland River)	52.6	32.3	24.7	29.9	26.0	22.2
Christian County (Hagerstown silt loam)	43.4	17.3	11.5	18.6	14.3	11.4
Trigg County (Hagerstown silt loam)	52.0	22.1	17.2	26.8	12.6	9.2
Grayson County (Tilsit silt loam)	46.7	5.3	1.1	4.0	3.0	0
Madison County (Johnsburg silt loam)	47.5	25.8	29.6	28.4	21.0	14.4
Average, above 6 tests	49.8	20.2	17.0	20.1	14.6	11.3

agement. Because of this and some injury from drought, little response to fertilizer was obtained.

As shown in Table 3, corn in general gave better response in 1945 to deep placement of fertilizers—broadcast and plowed under or in furrow bands—than to surface applications—bands along the row or broadcast after plowing and disked in. Response of corn to row application of fertilizer may have been lowered by the methods used. In the Lyon and Trigg County tests there may have been some injury to the germinating seedlings, as the fertilizer was applied in a single band close to the seed at planting time. In the Christian and Grayson County tests, row fertilizer was applied in side bands in furrows along the row after the corn was up, which may have reduced its effectiveness somewhat. Response to fertilizer broadcast and disked in after plowing, however, should be representative of average conditions.

Conclusions

Although two years' results are not enough to justify definite statements, the results obtained indicate that applications of fairly large amounts of fertilizer in plow-furrow bands or broadcast and plowed under are satisfactory methods of applying fertilizers for corn on most soils. In contrast, however, it should be stated that some farmers in Kentucky have obtained little return from plow-furrow application of as large amounts as 1,000 pounds of 6-8-6, or similar fertilizer, per acre on corn. Along with the deep application, a part of the fertilizer should usually be applied at the row. With prospective increases in the supply of fertilizer attachments for turning plows, the method of furrow-band application offers a simple, low-cost means of applying fertilizer. Few corn planters in Kentucky, as well as throughout the southeastern region, are equipped with adequate fertilizer attachments, espe-

cially those for applying large amounts. Most other methods of application involve an additional operation, which adds to the cost of production.

The general problem of what plant food and how much to apply for corn involves other considerations. Where corn is grown in rotation with small grain and hay on soils of a fair to good level of fertility, it is the belief of the writer that most of the phosphate and potash should be applied for the small grain rather than for corn, in order to get maximum net return from the fertilizer used. In favorable seasons under Kentucky conditions heavy, direct fertilization of corn grown in such a rotation also may pay, but adverse weather conditions will often prevent the desired return. Many soils having a fairly low level of fertility should give a profitable response to direct fertilization of corn with moderate to large applications of fertilizer. Even on such soils, however, drought often prevents the desired crop response. Poorly drained soils or those subject to overflow, which are cropped nearly continuously to corn and on which crop rotation is not successful, also should give a profitable response. Profitable returns from heavy fertilization of hybrid seed corn, a high acre-value crop, can be expected. In these situations a complete, well-balanced fertilizer should usually give best results.

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Sweet Potatoes Are Proving New Gold for the South

(*From page* 22)

encro Cooperative reached a point in 1945 that forced the association to limit its membership, even after expanding its facilities. The association bought additional land, provided more storage space, doubled the size of the packing shed, and installed a dehydrating plant for processing cull potatoes for feed.

The association has the latest equipment for washing and waxing, grading, packing, labeling, loading, and shipping potatoes. The cooperative last year sold 240 carloads for over $300,000 and made savings of $31,470 before the payment of dividends on preferred stock.

The cooperative buys crates in carload lots from the cooperative box factory at Hammond. It also handles feed and fertilizer for its members, making substantial savings in this respect. Membership of the association increased from 60 in 1943 to 250 in 1945. The association has been financed by the New Orleans Bank for Cooperatives.

The Ossum Farmers Cooperative at Scott, Louisiana, also has been highly successful. This cooperative handled 100 cars of sweet potatoes during the first season in 1944 and made net savings of $10,128. It paid a 6 per cent dividend on preferred stock and credited the remainder to the members on a patronage basis.

Another producers' association which is making a good record is the Sweet Potato Growers, Incorporated, at Laurel, Mississippi, where around 1,000 members of the association and 600 4-H Club boys sold a half million dollars worth of potatoes from the 1945 crop. When we visited the cooperative early in November, the dehydrating plant was being operated at full capacity, two big curing houses were filled, other available storage space was

packed, and deliveries to the plant had been temporarily halted.

W. M. Crumpton, general manager, said the cooperative would dehydrate 1,375,000 pounds of potatoes under Government contract and 250,000 pounds for the commercial trade.

The association was paying growers $42 per ton for grade 1 and grade 2 potatoes, plus an allowance for hauling. The amount of this allowance depended on the distance of the haul. Growers in Pike County, about 100 miles away, were paid $48.50 per ton. The association furnished crates.

Beginning in January No. 1 cured sweet potatoes will be graded and marketed. The cooperative has installed brushing, washing and waxing, grading and loading equipment.

The association is pioneering in marketing 40,000 bushels of carefully graded, high quality sweet potatoes in 5-pound open mesh bags through chain stores in Laurel, Hattiesburg, Jackson, and New Orleans. It is believed that this method of marketing will help to popularize sweet potatoes and increase the demand by consumers.

Another contribution to improved sweet potato production has been the work of 600 4-H Club boys in 12 counties. The club members, who have worked under direction of state and county extension agents and according to specifications of a written agreement with the association, have produced Unit One Porto Rico sweet potatoes in quantity for seed to help standardize this variety, simplify marketing, and get a higher price. They also demonstrated recommended practices in the production and harvesting of sweet potatoes. Representatives of the extension service and the association assisted the 4-H boys in giving 35 bedding and harvesting demonstrations.

Under the agreement, the cooperative furnished the boys with seed potatoes and served as marketing agent, accepting, storing, curing, grading, packing, and selling the potatoes.

The most efficient feed dehydrating plant we visited was at Perry, Georgia. It is one of three pilot plants built by Cleaver-Brooks Company of Milwaukee, which spent practically a year improving and perfecting the dehydrating equipment which is installed in a concrete, tile, and steel building. The plant is operated 16 hours a day with

J. E. Snowden, Mississippi Extension Marketing Specialist, left, and W. M. Crumpton, Laurel, display graded sweet potatoes. Crates are packed to the roof in curing houses.

This picture shows how dehydrated potatoes are carefully inspected before being packed in cans, crated, and shipped overseas.

two crews of four men each. It turns out a ton of dry feed per hour.

Sweet potatoes were dehydrated for producers for one-third toll. Three tons of raw potatoes produced about one ton of dried potato feed. Farmers with whom we talked said they were pleased with the results. Livestock liked the feed.

R. T. Tuggle, a successful farmer near Perry, told us that he had 20 acres in sweet potatoes in 1945. He harvested and sold 2,250 bushels for market at an average price of $1.40 per bushel. The buyer furnished crates and picked up the potatoes at the end of the rows.

After selling $157.50 worth of sweet potatoes per acre, Mr. Tuggle hauled 45,000 pounds of cull potatoes to the processing plant for drying. He was feeding the potato meal to both hogs and beef cattle with satisfactory results.

Georgia agricultural officials are proposing the establishment of 365 plants similar to the one at Perry which will dry any kind of feed crop. Each plant would handle the production from 2,500 acres of crops planted preferably within a radius of five miles of the plant.

The plants would furnish all harvesting equipment and harvesting crews, harvest, haul, and dehydrate the crops and deliver the cured product back to the farm. Crops to be grown would include kudzu, alfalfa, soybeans, cowpeas, lespedeza, sweet potatoes, and sorghum.

Each plant would cost about $28,000 for buildings and dehydrator, $6,600 for harvesting and hauling equipment, with about $15,000 needed for operating capital. Such plants could be built and operated by individuals, partnerships, corporations, or cooperatives.

Much of the value of the plants would come from harvesting and dehydrating crops in the green stage regardless of weather conditions and when the feed value of the plants is at the highest point. Under field conditions farmers frequently suffer heavy losses when crops mature during rainy periods. Forage crops may become too mature and woody, many of the leaves may be lost, and the entire crop damaged by rotting or bleaching.

Dehydration makes possible the harvesting of an entire crop without loss and when it is worth the most.

Pasture Possibilities On Coastal Plain Hills

(*From page* 10)

increased; second, the grasses and legumes produced become more nourishing. After the plants become richer in food value, they are more readily eaten by animals. The increase in food value can often be almost phenomenal, especially when improvement practices are carried out on soils which have been very deficient in nitrogen, phosphorus, potassium, and calcium.

Lumpkin has done an excellent job in carrying out an erosion control and soil improvement program on his farm. He has this to say about improved pastures. "Because of the low yields of our cultivated crops, our many erosion control problems, and the competition we have with the more fertile agricultural areas in the production of row crops, we farmers of the hill areas need to turn to something else for a good living. I find that improved pastures are one of our best methods of controlling erosion, bringing back the so-called, worn-out hill lands to productivity, and at the same time furnishing a profitable return.

"The South, with its 9 to 12 months of annual grazing, should be able to compete more successfully in the production of livestock with other sections of the United States which have a much shorter grazing season.

"I see by the reports that Louisiana imports beef and dairy products from other states when our State has pasture possibilities as good as practically any other state in the Union. I am sure that the establishment and maintenance of improved pastures will reverse this condition."

Wheat Winnowings

(*From page* 5)

slices of ready-cut bread and preventing loss and waste of it, as his main part in filling those hungry mouths abroad.

Nothing brings home to us more succinctly the major changes that have taken place in the channels of food distribution than this sudden light thrown on our inability to act individually in saving wheat flour appreciably. There may be one gain in it on the thrift side, and that advantage comes from the ability of the processors to combat weevils in stored flour much better than could the home-owners.

In the matter of improving the scientific food values of white flour and bread, our government began where the competitive instincts of the bakers left off. The very first war-food order issued from Washington in 1943 required the enrichment or reinforcement of all bakers' white bread by addition of the vitamins, thiamine, riboflavin, and niacin, plus one mineral, iron.

This resulted in seven times the thiamine, eight times the riboflavin, and four times the niacin and iron found in the fortified white bread compared with the normal loaf. Except for the riboflavin content, which is higher, these vitamins artificially added to flour just about restore the natural vitamin values of the wheat berry before it is milled into refined white flour. Of course, the protein volume of whole wheat flour is still superior to that of the patent article.

Despite the fact that we American consumers rely so much on meat and varied diets, and have so much more and better menus than the best afforded abroad, in general grain foods give us about as much protein as we get from

meat, poultry, game, and fish together. Naturally protein coming from this source alone would fall short indeed of giving the body-building tone which, fortunately, we have thus far been able to secure from eggs, meats, vegetables, and milk. Habitual reliance on our part to a sturdy and healthful American diet throws us open to criticism as being indifferent and heedless of the plight of those who never have and maybe never will attain the stomach-satisfying standards we enjoy so thoughtlessly.

BEFORE leaving the topic of fortified foods, let us recall that only 18 states thus far have mandatory laws to require enrichment with vitamins of all white flour and bread sold therein. However, the Council of State Governments is distributing a sample bill for use in states where similar laws are considered. They tell me in the home-ec sanctums that the ingredients needed to enrich all the bread and flour sold in this country in a year at 1945 prices would only dock a person 18 cents for the privilege of safeguarding digestion, heart action, nerve force, and that "all-in" feeling.

At the risk of serving "bread and milk" in this essay, it is also important to remember that when we can work and plan to save the best of the natural vitamins in our foods, like cow's milk, for instance, we will be charting a safe and sane course. It is well to observe that the dairy cows of America in a certain recent period are said to have produced three-quarters as much C vitamin, or ascorbic acid, as the citrus orchards of Florida and Texas and California combined. Somewhere in the picture the bulk of this vitamin disappeared, which leaves the job of the dairy scientist cut out for him, to find ways to prevent that great loss without throwing dead cats meanwhile at the oleo industry for adding 9,000 units of vitamin A per pound to its fatty compound.

IN the midst of this rush of federal regulatory orders and critical comments by the feed and food interests and the community club campaigns to save waste fats and kitchen scrapings, it would do anybody a heap of good to talk over this foreign food situation with a veteran or an authority on nutrition.

In fact, some of our rural social clubs could easily cut out many kinds of cake, pie, and fancy fixings and hold a self-denial banquet—maybe serving just twice the average daily meal of a starving foreigner. As the speaker of the evening bring out the keen local boy who saw how slim the rations were in homes across the sea. Mawkish, sentimental palavering at such festivals and a big hog-feed afterwards on the sly are not in order. In these days of riding-machinery and electric gadgets and labor-savers, I know plenty of ruralites who could spare a pound of flesh around the belly without missing much. I hate to carry the idea further toward the metropolitan night-spots, as this paper is careful about the kind of descriptive terms used in embellishment of one's most heated thoughts.

Anyhow, I mention this fresh from a chat with a man from South Carolina who served awhile as county agent prior to working in Albania as agricultural rehabilitation director for UNRRA. He told how the peasants from the villages in the mountains there came down to the seacoast to meet the wheat-laden ships. By army truck the supplies were taken to the edge of the ranges and thence by donkey pack and pick-a-back through deep snowdrifts and glacier passes into the hinterlands of hunger.

It seems that busy village and prefecture committees had allotted this wheat beforehand, so that no family that still had two and a half bushels of it laid away might receive any of the new consignment. The Albanian farmer ate whole wheat or corn bread for his meals, and no sugar or coffee was on tap. The big boss-men of the prefecture, on entertaining special guests like our county agent, served three courses —goat-milk cheese, sour brine pickles, and mutton chops, plus some coarse black bread. Sometimes they had a

little tidbit like plums in honey preserves saved up from happier and more tranquil times.

For the harvest of 1946, gleaned in May and June, the farmers planted Tenmarq, Cheyenne, and Barrt winter wheat sent from our shores and tilled and seeded the land with 50 Yankee-made tractors hitched to drills made in Racine or Peoria. One outfit using a ten-foot drill sowed several thousand acres on 24-hour shifts. Seed corn of hybrid vigor, the pride of Iowa corn-husking contests, was used to plant large areas for the last season's fairly successful crop in the northern Albanian provinces.

THE point I got from this chat was that the natives appreciated fully what we had sent them, at little real injury or cost to us, but they were often too busy and worn out to indulge in effusive praise. At least they have learned that we can organize to a degree for relief, even if it may not be as powerful and efficient as our capacity for ruin.

I wonder at this point if all our wishful welfare thinking and our good will toward hungry men can be quick and strong enough to overcome the stealthy and insidious approach of more warmongering motives. If all we can do is to build generations and save money with which to engage in more carnage and power politics, it brings to mind the ancient adage that men do not live by bread alone—even fortified bread.

"Now children," said the kindergarten teacher, "we'll draw what we'd like to be when we grow up."

At the end of twenty minutes everyone handed in a picture except little Butch McGurk. His paper was blank.

"Why Butch," remonstrated the teacher, "isn't there anything you want to be when you grow up?"

"Sure, teacher," replied little Butch. "I'd like to be married, but I don't know how to draw it."

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THE AMERICAN POTASH INSTITUTE

1155 16TH STREET, N. W. WASHINGTON 6, D. C.

The officer gazed sternly at the private who had been brought before him.

"Did you call the sergeant a liar?" he demanded.

"I did, sir."

"And did you go on to describe him as a pop-eyed, knock-kneed, good-for-nothing louse?"

The private hesitated. Then, with a note of regret in his voice, he replied: "No, sir, I forgot that."

Then there was the Scotchman who was beaten almost to death because he thought the sign on the door said "Laddies."

During a dieting ordeal, Fanny Hurst, the novelist, was out for her daily constitutional when she passed Irvin Cobb. The late humorist failed to recognize her.

"Why, Irvin," she called out, "don't you know me? It's the same Fanny Hurst."

Cobb turned slowly and surveyed her. "It may be the same Hurst," he said, "but it certainly isn't the same Fanny."

DOCTOR'S ORDERS

"Ralph, I thought that the doctor told you to stop all drinks."

"So what? You don't see many getting past me, do you?"

"Little boy, do both of your dogs have licenses?"

"Yeah. They're just covered with them."

Visitor: "So you call your canary 'Joe'. Does that stand for Joseph or Josephine?"

Johnny: "We don't know. That's why we call it 'Joe'."

ACQUIRED POLISH

Asked if a year of college had made any difference in his eldest son, a deep-South farmer reflected: "Well, he's still a good hand with the plow, but I notice his language has changed some. It used to be, 'Whoa, Becky! Haw! and Git up!' Now when he comes to the end of a row, he says, 'Halt, Rebecca! Pivot and proceed!' "

The reason most women don't look good in slacks is because the distance is too great between their hip pockets.

SUDDEN DROP

First G. I.: "The touch of the nurse's hand cooled my fever instantly."

Second G. I.: "Yeah, we heard the slap all over the ward!"

Indian gals have a lot of fun with their beaux and errors.

Jimmy: "Daddy says there isn't another woman in the world like you, Momma."

Mother: "That's very flattering of him."

Jimmy: "And he says it's a good thing, too."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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SOME FARMS are smaller than a city block. Others cover most of a county. The average U. S. farm is 174 acres. But land measurements are only one factor in determining the size of a farm. A farm is as big as its power to produce.

By increasing your farm's power to produce, V-C Fertilizer makes your farm a bigger and better farm *in yields and profits.*

Another man may own two to three times as many acres as you own. But, if his acres are poorly-fertilized scrub acres and your acres are good land, well-fertilized with V-C Fertilizer, your farm is as big as his *in yields* and your farm is a bigger farm *in profits.*

His costs of production are much greater than yours, because he has to prepare, plant, cultivate and harvest much more land than you do to get the same yield. V-C Fertilizer adds extra yields of better quality crops to your farm, without the work, worry and expense of extra land.

V-C Fertilizer is your best investment. It helps each hour of your work and each acre of your land return a richer harvest. You will never know how really big your farm is *in yields and profits,* until you try using plenty of V-C Fertilizer—the leader in the field since 1895.

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NEW CONTRIBUTIONS TO AGRICULTURE

IN OUR DEVELOPMENT of new agricultural chemicals, and evaluation of their worth to the farmer, we are ever appreciative of the interest and assistance of agricultural scientists and experiment stations that have investigated our new chemicals for disease, insects, and weed control. We offer our continuous cooperation to these and other scientists who might wish to test these chemicals for their own localities, or for crops of their own specific interest. Inquiries are invited.

PHYGON—A Dichloro-Naphthoquinone compound of remarkable fungicidal value. Concentrations as low as ½ lb. per hundred gals. of water prove a most effective spray for Apple Scab, Brown Rot of Stone Fruits, Alternaria and Anthracnose of Tomatoes. Phygon is water-insoluble; has high persistence through rain; also used effectively as seed treatment especially for spinach, beets, sorghum, and beans.

TUFOR—for control of weeds in grains, grass, and other narrow foliage vegetation. A water-soluble derivative of 2.4 dichloro-phenoxy acetic acid of reduced volatility, TUFOR has been well proved on obnoxious broad-leaved plants such as Thistles, Ragweed, Pokeweed, Dandelions, Plantains, Poison Ivy and Virginia Creeper.

SYNDEET DDT SPRAY—solution of DDT in a synthetic oil which is itself highly fatal to aphids and mites, the outstanding pests not controlled by DDT. Suspension of 1pt. Syndeet compound in 100 gals. water gives excellent and persistent control over: Japanese Beetle, Codling Moth, Colorado Potato Beetle, and Potato Flea Beetle, Aphids, and European Red Mites.

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THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

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In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
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IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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